



AGRICULTURAL RESEARCH INSTITUTE

PUSA







**THE ANNALS**  
**AND**  
**MAGAZINE OF NATURAL HISTORY.**

**INCLUDING**

**ZOOLOGY, BOTANY, AND GEOLOGY.**

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LONDON AND  
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY'.)

**CONDUCTED BY**

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**AND**

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"Omnes res creatæ sunt divins sapiens et potentis testes, divitiæ felicitatis humanæ:—ex hæc usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini, ex æconquâ in conservatione, proportionè, renovatione, *potentia* majestatis elucet. Harum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper infuica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRÜCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . . The sylvan powers  
Obey our summons; from their deepest dells  
The Dryads come, and throw their garlands  
And odorous branches at our feet; the Nymphs  
That press with nimble step the mountain-thyme  
And purple heath-flower come not empty-handed,  
But scatter round ten thousand forms minute  
Of velvet moss or lichen, torn from rock  
Or rifted oak or cavern deep: the Naiads too  
Quit their loved native stream, from whose smooth face  
They crop the lily, and each sedge and rush  
That drinks the rippling tide: the frozen poles,  
Where peril waits the bold adventurer's tread,  
The burning sands of Borneo and Cayenne,  
All, all to us unlock their secret stores  
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.



# CONTENTS OF VOL. X.

[NINTH SERIES.]

## NUMBER 55

	Page
I. On Mediterranean <i>Tervia</i> and <i>Idmonea</i> (Bryozoa). By ARTHUR WM. WATERS, F.L.S., F.G.S. (Plates I. & II.)	1
II. New Ants from Australia. By W. C. CRAWLEY, B.A., F.E.S., F.R.M.S.	16
III. Notes on the <i>Asilinae</i> of the South African and Oriental Regions. By GERTRUDE RICARDO	36
IV. Coleoptera, <i>Erotylidae</i> and <i>Endomychidae</i> , from the Seychelles, Chagos, and Amirantes Islands. By GILBERT J. ARROW. (Plate III.)	73
V. New or little-known <i>Tipulidae</i> (Diptera).—XI. Australasian Species. By CHARLES P. ALEXANDER, Ph.D., F.E.S., Urbana, Illinois, U.S.A.	83
VI. On a Collection of Mammals obtained by Capt. G. C. Shortridge in Northern Rhodesia, with Field-notes by the Collector. By P. S. KERSHAW	99
VII. A curious Case of a Hermaphrodite Frog. By W. HAROLD LEIGH-SHARPE, M.Sc. (Lond.)	111
VIII. Diagnoses of new Species of Non-marine Mollusca from Portuguese South-east Africa. By M. CONNOLLY	113
IX. Some new Silurids from the Congo. By EINAR LÖNNBERG and HIALMAR RENDAHN	122
X. A Selection of Lectotypes of the typical Australian Marsupials in the British Museum Collection. By OLDFIELD THOMAS	127
XI. On a new Subspecies of <i>Zaglossus</i> , with Remarks on other Species of the Genus. By OLDFIELD THOMAS and Lord ROTH-SCHILD	129
XII. Exotic <i>Muscaridae</i> (Diptera).—VI. By J. R. MALLOCH, Washington, D.C.	132

	Page
XIII. On Bandicoots allied to <i>Perameles bougainvillei</i> . By OLD-FIELD THOMAS .....	143
XIV. Previously undescribed <i>Scolytidae</i> and <i>Platypodidae</i> from the Indian Area. By Lt.-Col. F. WINN-SAMPSON, F.E.S. ....	145
XV. On the probable Habits of the Dinosaur <i>Struthiomimus</i> . By Baron FRANCIS NOPCSA, Foreign Corresp. Geol. Soc. London ....	152
XVI. A Case of Secondary Adaptation in a Tortoise. By Baron FRANCIS NOPCSA, Foreign Corresp. Geol. Soc. London .....	155
XVII. Fossil Arthropods in the British Museum.—VIII. Homoptera from Gurnet Bay, Isle of Wight. By T. D. A. COCKERELL, University of Colorado .....	157
XVIII. Papers on Oriental <i>Carabidae</i> .—VIII. By H. F. ANDREWES .....	161
XIX. New South African Species of the Genus <i>Chlamis</i> (Carabidae). By C. N. BARKER, F.E.S. (of the Durban Museum) .....	170
Dr. William Carruthers .....	176

## NUMBER 56.

XX. On a Collection of Mammals from Chiromo and Cholo, Ruo, Nyasaland, made by Mr. Rodney C. Wood, with Field-notes by the Collector. By P. S. KERSHAW .....	177
XXI. Results of the Oxford University Expedition to Spitsbergen, 1921.—No. 14. Diptera Nematocera. By F. W. EDWARDS. ....	193
XXII. Note on Root-division in the Molar Teeth of <i>Tritylodon</i> . By Dr. BRANISLAV PETRONIEVICS .....	216
XXIII. Two new Fishes from New Britain and Japan. By J. R. NORMAN .....	217
XXIV. Results of the Oxford University Expedition to Spitsbergen, 1921.—No. 15. Saw-flies. By F. D. MORICE .....	219
XXV. Notes on <i>Lucernaria quadricornis</i> , Müller, and related Species. By RICHARD ELMHURST, F.L.S., Superintendent of the Millport Marine Biological Station .....	221
XXVI. Notes on certain Reproductive Phenomena in some Tasmanian Marsupials. By Professor T. THOMSON FLYNN, D.Sc., University of Tasmania .....	225
XXVII. On a new Race of Bharal. By Lord ROTHSCHILD, F.R.S. ....	231
XXVIII. Description of a new Baboon. By Lord ROTHSCHILD, F.R.S. ....	232

	Page
XXIX. Preliminary Note on the Affinities of the Genus <i>Lipotes</i> . By MARTIN A. C. HINTON and W. P. PYCRAFT .....	232
XXX. On the Morphology of the Bursate Nematode <i>Brachyclonus indicus</i> , Raill. & Henry, 1910. By M. KHALIL, M.D., Ph.D., Parasitologist to the Zoological Society of London .....	235
XXXI. On <i>Oswaldocruzia wisei</i> , a new Nematode from the "Saki" Monkey. By F. PHILPOT, M.Sc. ....	242
<i>New Book</i> :—Practical Zoology for Medical and Junior Students. By J. D. F. GILCHRIST and C. VON BONDM .....	245
Proceedings of the Geological Society .....	245 248

## NUMBER 57.

XXXII. The Classification of the Fishes of the Family <i>Cichlidae</i> .—II. On African and Syrian Genera not restricted to the Great Lakes. By C. TATE REGAN, M.A., F.R.S. ....	249
XXXIII. Descriptions and Records of Bees.—XCV. By T. D. A. COCKERELL, University of Colorado .....	265
XXXIV. New <i>Franiidae</i> and <i>Braconidae</i> in the British Museum. By ROWLAND E. TURNER, F.Z.S., F.E.S. ....	270
XXXV. <i>Travassosius rufus</i> , gen. et sp. n.: a Nematode ( <i>Trichostrongylidae</i> ) parasitic in the Stomach of the Norwegian Beaver. By M. KHALIL, Ph.D. (Lond.), M.D. (Brux.), D.P.H., Hon. Parasitologist to the Zoological Society of London .....	281
XXXVI. On a new Linguatulid from the Adriatic. By STANLEY HIRST .....	289
XXXVII. Notes on a small Collection of Odonata from Argentina. By HERBERT CAMPION .....	290
XXXVIII. A new Eel from Tobago. By J. R. NORMAN .....	296
XXXIX. The Eel-worm in Paper-hangers' Paste [ <i>Anguillula eeliriva</i> (Linnaeus, 1767), Stiles and Hassall, 1905]. By T. GOODEY, M.Sc. ....	297
XL. A new Hedgehog from Aden. By OLDFIELD THOMAS ....	307

## NUMBER 58.

XLI. Revision of the S. African Species of <i>Dinomotopus</i> , <i>Troglops</i> , <i>Chalcidius</i> , <i>Colotes</i> , <i>Helicogaster</i> , and the allied Genera, with an Account of their accessory ♂-characters [Coleoptera]. By G. C. CHAMPION, F.Z.S. (Plates IV. VI.) .....	309
XLII. South African Species of the Genus <i>Hypolithus</i> , Dejean. By C. N. BARKER, F.E.S. (of the Durban Museum) .....	359

	Page
XLIII. Exotic <i>Muscaridæ</i> (Diptera).—VII. By J. R. MALLOCH, Washington, D.C. ....	379
XLIV. On Mammals from the Yunnan Highlands collected by Mr. George Forrest and presented to the British Museum by Col. Stephenson R. Clarke, D.S.O. By OLDFIELD THOMAS .....	391
XLV. Note on the Skeleton of a large Plesiosaur ( <i>Rhomaleosaurus thorntoni</i> , sp. n.) from the Upper Lias of Northamptonshire. By CHARLES W. ANDREWS, D.Sc., F.R.S. (British Museum, Natural History). (Plates VII.-IX.) .....	407
XLVI. A new Sea-star from Hong Kong. By W. K. FISHER, Hopkins Marine Station, Pacific Grove, California. (Plate X.)....	415
XLVII. A new Family of Hymenoptera from South Africa. By JAMES WATERSTON, B.D., D.Sc., Assistant Keeper, Department of Entomology, British Museum. (Plate XI.) .....	418
XLVIII. Coleoptera ( <i>Cerambycidæ</i> ) from the Seychelles Islands, Aldabra, and Rodriguez. By CHR. AURIVILLIUS (Stockholm). (Plates XII. & XIII.).....	421
XLIX. The Spider <i>Liphistius</i> : a Study in the Biology of a Primitive Animal. By T. H. SAVORY, B.A. ....	444
L. A Revision of the Genera of the Family <i>Liparidæ</i> . By Colonel C. SWINHOE, M.A., F.L.S., F.Z.S., F.R.S., Member of the Entomological Society of France and of the Bombay Natural History Society.	449

## NUMBER 59.

LI. Notes on African Non-marine Mollusca, with Descriptions of many new Species. By M. CONNOLLY. (Plate XIV.) .....	485
LII. Some new <i>Asilidæ</i> from Western Australia. By WILLIAM J. DAKIN, D.Sc., F.L.S., F.Z.S., Derby Professor of Zoology, University of Liverpool, and M. G. C. FORDHAM, B.Sc., Assist. Lect. Zoology, University of Liverpool. (Plate XV.) .....	517
LIII. Note on some Young Stages of <i>Gecarcoidea lalandii</i> , Milne-Edwards. By GLADYS E. WEBB, M.Sc., Assistant in Zoology Department, University College, London .....	530
LIV. On a new Brachyurous Crustacean from the Upper Cretaceous of Jamaica. By THOMAS H. WITHERS, F.G.S. (Plates XVI. & XVII.) .....	534
LV. <i>Macrotherium salinum</i> , sp. n., a new Chalicotheres from India. By C. FORSTER-COOPER, M.A., Superintendent of the University Museum of Zoology, Cambridge .....	542
LVI. Descriptions and Records of Bees.—XCVI. By T. D. A. COCKERELL, University of Colorado .....	544
LVII. A new Species of <i>Mastacomys</i> from a Cave in South Australia. By OLDFIELD THOMAS .....	550

	Page
LVIII. A new Jird ( <i>Meriones</i> ) from Southern Palestine. By OLDFIELD THOMAS.....	552
<i>New Book</i> :—The <i>Coccidae</i> of Ceylon. Part V. By E. E. GREEN..	553
Proceedings of the Geological Society. ....	<i>ib.</i>
On the Dates of Cuvier, 'Le Règne Animal,' etc. (Disciples Edition). By C. DAVIES SHERBORN .....	555

## NUMBER 60.

LIX. New or little-known <i>Tipulidæ</i> (Diptera).—XII. Australasian Species. By CHARLES P. ALEXANDER, Ph.D., F.E.S., Amherst, Massachusetts, U.S.A. ....	557
LX. Exotic <i>Muscaridæ</i> (Diptera).—VIII. By J. R. MALLOCH, Bureau of Biological Survey, Washington, D.C. ....	573
LXI. Fishes of the Clupeid Genera <i>Clupeoides</i> and <i>Potamalosa</i> , and allied Genera. By C. TATE REGAN, M.A., F.R.S. ....	587
LXII. Notes on Asteroidea.—III. By W. K. FISHER, Director, Hopkins Marine Station, California .....	590
LXIII. On the Genus <i>Notykus</i> (Mich.), and on a new Species of that Genus. By FRANK E. BEDDARD, M.A., D.Sc., F.R.S. ....	599
LXIV. On some new Mammals from Korea and Manchuria. By Prof. T. MORI, Keijo High School, Seoul, Korea .....	607
LXV. On Two Forms of the Korean Hedgehog. By Prof. T. MORI, Keijo High School, Seoul, Korea.....	614
LXVI. A new Bat of the Genus <i>Miniopterus</i> from N. Australia. By OLDFIELD THOMAS .....	616
LXVII. New Species of Neuroptera in the British Museum. By P. ESBEN-PETERSEN, Silkeborg, Denmark.....	617
LXVIII. On some Land Mites (Acari) from Spitsbergen and Bear Island. Results of the Oxford University Expedition to Spitsbergen, 1921.—No. 23. By Rev. J. E. HULL, M.A. ....	621
Proceedings of the Geological Society .....	624
On the Dates of Cuvier, 'Le Règne Animal,' etc. (Disciples Edition). By C. DAVIES SHERBORN .....	<i>ib.</i>
Index .....	625



# PLATES IN VOL. X.

- PLATE I. { Tervia and Idmonea.
- II. {
- III. Endomychid Coleoptera from the Seychelles.
- IV. {
- V. { African Malachiinæ.
- VI. {
- VII. Sacral region of vertebral column of *Rhomaleosaurus thorn-*  
toui, sp. n.
- VIII. Shoulder-girdle of *Rhomaleosaurus thorn-toni*, sp. n.
- IX. Pelvic girdle of *Rhomaleosaurus thorn-toni*, sp. n.
- X. *Asterina orthodon*.
- XI. *Dinapsis turneri*, sp. n., ♀.
- XII. {
- XIII. { Cerambycidæ from the Seychelles and Rodriguez.
- XIV. African Streptaxidæ.
- XV. Asilidæ from Western Australia.
- XVI. {
- XVII. { *Carcinoretes woolacotti*, gen. et sp. n.

# THE ANNALS

## AND

### MAGAZINE OF NATURAL HISTORY.

[NINTH SERIES.]

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"..... per litora spargite muscum,  
 Naiades, et circum vitreos considite fontes:  
 Pollice virgineo teneros hinc carpite flores:  
 Floribus et pictum, divæ, replete canistrum.  
 At vos, o Nymphæ Craterides, ite sub undas;  
 Ite, recurvato variata corallia trunco  
 Vellite muscosas e rupibus, et mihi conchas  
 Ferte, Dææ pelagi, et pingui conchyliis succo."  
*N. Partheni Giannettasi, Eccl. 1.*

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No. 55. JULY 1922.

#### I.—On Mediterranean *Tervia* and *Idmonea* (Bryozoa). By ARTHUR WM. WATERS, F.L.S., F.G.S.

[Plates I. & II.],

	Distance be- tween series.	Width of zoarium.	Zoœcial aperture.
	mm.	mm.	mm.
<i>Tervia irregularis</i> , Meneg. (p. 5) . . .	0·8	0·45	0·08
" <i>discreta</i> , Jull. (p. 7) . . . . .	0·8	0·35	0·08
<i>Idmonea notomale</i> , Busk (p. 7) . . . . .	0·95–1·05	1·85	0·16
( " <i>petri</i> , d'Arch. & Canu (p. 8) . .	0·4	1·05	0·14)
" <i>atlantica</i> , Johnst. (p. 9) . . . .	0·5–0·9	0·6	0·07
" <i>meneghinii</i> , Heller (p. 11) . . .	0·5–0·55	0·75	0·08
" <i>triforis</i> , Heller (p. 12) . . . .	0·35–0·4	0·35	0·09
" <i>serpens</i> , auct. (p. 13) . . . . .	0·4	0·6	0·08
" <i>philippæ</i> , Harmer (p. 14) . . .	0·36	0·5	0·08

The measurements of the distance between two series is taken near the middle of a branch, as there is more irregularity in the early growth or near a bifurcation, and, although as a rule there is very little variation, the figures must be taken as good averages. The measurements of the zoœcia are taken

internally at the aperture. In a limited area, like the Mediterranean, measurements give the readiest means of recognising Cyclostomatous species, but in comparisons of species from distant localities we must not expect as much uniformity. Zoöcial and zoarial measurements are usually good characters, but may be one of the first to change.

### INTRODUCTION.

*Idmonea*, Lamouroux, has received much study, but nearly all that had been written, until the ovicells became available as a character, may be considered valueless, and the same is the case with a great part of the Cyclostomata.

We are now agreed that the different forms of ovicell are very important, and much more attention is being given to the ovicells and their ducts. Canu and Bassler\*, in a large and most important work, give particulars of a large number of ovicells, and base their classification largely on the oöciostome, and my present investigations are, to a large extent, directed to seeing to what extent we can rely upon the characters used. I have referred to the importance of the ovicell in many papers, and to me Messrs. Canu and Bassler's work is most interesting in giving particulars in such a large number of cases.

However, do we yet know how much value must be given to each character? And there are cases where I should have considered that the ovicells gave only specific (and not generic or even family) characters, and this has now to be studied. For example, the ovicells in *Diastopora* are most useful, and we can thereby distinguish, for example, *D. olelia*, J., and *D. patina*, L.; but are the differences, which are mainly in shape, sufficient for generic (much less family) divisions? The type is the same. Other characters may support or disprove present views. Further, the ovicell of *Plagiæcia* and *Microæcia*, Canu†, is very similar. Canu places *D. sarniensis*, Norm., under *Microæcia* as the type, but the Guernsey type-specimen in the British Museum has wide tangential ovicells, including many zoëcia; the oöciostome is slightly funnel-shaped with a wide funnel (0·08 mm.), also my Guernsey specimen, determined by Norman, has fairly large tangential ovicells, though broken down. Hincks has also described *D. sarniensis* with ovicells transversely elongate

\* "N. Amer. Early Tert. Bry.," U.S. National Mus. Bull. 106 (1920).

† *Loc. cit.* pp. 326-327.

sub-elliptical inflations of the zoarium of considerable size. There are in *D. sarniensis* tubular closures to the zoœcia. It will be seen that *Microœcia*, as based on *sarniensis*, Norm., breaks down; however, Hincks figures *D. suborbicularis*, H., with ovicell of the microœcia type, and says "somewhat oval."

Before Canu made his classification of the Cyclostomatous Bryozoa, I was intending to indicate three types of ovicell in *Diastopora*. The first is small, and does not seem to have any zoœcial tube passing through it, so that it occurs between three or four zoœcia; this form, which I was going to call the simplex form, has been figured by Hincks in his *D. suborbicularis*. The next, including *D. obelia*, John., *D. intricaria*, Sm., *D. concinna*, MacG., *D. cristata*, MacG., spreads over many zoœcia, which, as well as the zoœciules, pass through the ovicells, and these were considered the conglomerate form; while the third has wide ovicells, called tangential ovicells, as in *D. patina*, *D. latomarginata*, d'Orb., *D. obelia*, Johnst., *D. compacta*, Norman.

In 1914 \* I put together what I had gathered from my own collection, etc., concerning Cyclostomatous ovicells, as showing the direction in which work was wanted. Shortly afterwards, possibly somewhat influenced by what I said, Canu †, who had long been working in the same direction, gave much more extensive information, evidently from more material than I had available. Now, what I would say is, fuller examination is required to see which characters are variable, and as far as possible we should examine cases where several ovicells occur on the same zoarium.

It has been customary to say, ovicell at a bifurcation, and so on, but, although the ovicell is frequently at a bifurcation, we may find it in a species sometimes at a bifurcation, sometimes elsewhere, as we see in *Tervia irregularis*, *T. meneghinii*, and in various species of *Idmonea*—thus the position on the zoarial branch is a character of but limited value. A considerable quantity of *Tervia irregularis* has been examined, but the number of ovicells seen is relatively small, and this paucity occurs very generally in the Cyclostomata. From the North Italian Bartonian I have had through my hands a very large number of fossil *Idmonea*, but do not recall any ovicell having been found. The Mediterranean

\* "Bry. from Zanzibar," Proc. Zool. Soc. 1914, p. 834.

† "Les ovicelles des Bry. Cyclost.," Bull. Soc. Géol. de France, ser. 4, vol. xvi. (1916).

*Idmonea* are represented in the Bartonian either by the same species or allies, and ovicells of nearly all are now known in the Mediterranean. It will thus evidently be a slow and gradual process checking the importance of ovicell characters.

I \* have repeated more than once my opinion that characters of great value in one group or family are almost useless in the next, and all attempts at fixing certain characters of A.1 importance, others secondary, and so on, may lead to no result, and we have to see what characters occur together in various groups. Levinsen has expressed the same idea in other words. Although it is dangerous to say a certain character ought to have the first place, another the second, of course it is not meant that physiological reasons must be ignored—however, is not the value of a character quite as much a question of when a separation based on it took place?

Canu and Bassler † say, "We repeatedly have to remark that the zoarial form is of no value for generic classification." I certainly cannot go as far as this, and it brings us up against a most important point that requires settlement. It has been established that, in the classification of the Cheilostomata, zoœcial characters are more important than zoarial, but in the Cyclostomata the classification has been entirely based on zoarial characters. It is, however, often difficult to decide what is zoœcial, what zoarial. In the Cheilostomata, as a rule, each zoœcium is only in growth-connection with its immediate neighbours, and there may be exactly similar zoœcia aduate or erect, or placed back to back—as, for example, in *Steganoporella* and several other genera,—and it took some time before the last generation could agree to their being placed together. Zoarial characters should, however, be stated in both of the suborders.

In the Cyclostomata the young zoœcia grow under the old zoœcia, and may commence a considerable distance from the end of the zoœcium, and the way they are grouped together seems to depend almost as much on the zoœcia as on the zoaria. In a section of *Entalophora* and several other genera the small early zoœcia are seen in the centre, so that they are not definitely under the older zoœcia as in *Idmonea*, but the principle is the same. Smitt ‡ has passed a fine hair through one of the basal cells of *Idmoneu atlantica* for the distance

\* "Bry. from Zanzibar," Proc. Zool. Soc. 1913, p. 460, note.

† *Loc. cit.* p. 759.

‡ Krit. fort. of Skand. Hafs. Bry. p. 441 (1866).

of four and a half series. In all cases the increase of the zoöcial tube is very gradual.

Seeing at what an early stage preparations are made for the form of the colony, and what radical differences there are almost from the beginning, it would seem strange if the colonial form did not give any assistance in classification; and when the ovicells are known in most genera, then studying zoöcial, zoarial, and ovicell characters together will show us their importance, but it does not follow that the value will be the same in all genera. We are finding an increasing number of species which may occur either adnate or erect.

*Tervia irregularis* (Meneghini). (Pl. I. figs. 1-9.)

For synonyms, see Miss Jelly's Catalogue under *Filisparsa*, and add :—*Tervia irregularis*, Jull. & Calv., Bry. de Camp. de l'Hirondelle, pp. 114, 157, pl. xiv. fig. 7 (1903); Waters, "Mar. Fauna Brit. E. Africa," Proc. Zool. Soc. 1914, p. 843, pl. iv. fig. 8.

*Idmonea irregularis*, Haswell, "Pol. Queensland," Proc. Linn. Soc. N. S. Wales, vol. v. p. 35 (1880); Waters, "Bry. N. S. Wales," pt. iii., Ann. & Mag. Nat. Hist. ser. 5, vol. xv. p. 255 (1887); "Ovicells of Cyclos. Bry.," Journ. Linn. Soc., Zool. vol. xx. p. 279, pl. xiv. figs. 5, 6 (1888).

*Filisparsa irregularis*, Calvet, Trav. & Talisman, p. 472; Norman, 'Madeira,' p. 279, typical; var. *superba*, p. 279, pl. xxxiv. figs. 1-3 (1909); Barrosa, "Bri. de la Estación de Biología Mar. de Santander," Trab. del Mus. de ciencias. nat. No. 5, p. 57 (1912); Friedl, H., "Bry. des Adria," Zool. Anzeiger, vol. xlix. pp. 225, 268 (1917).

*Tervia folini*, Calvet, "Camp. du Caudan," Ann. de l'Univ. de Lyons, p. 265, pl. vii. fig. 3 (1896).

*Filisparsa varians*, Neviani, Cont. Bri. foss. Ital. p. 43, pl. iv. fig. 21 (1891).

*Tervia jellyce*, Harmer, Poly. of the 'Siboga' Exp. pt. 1, p. 143, pl. xi. figs. 1-3 (1915).

This is abundant near Capri, and the zoöcia, as well as the internodes, are very long. The short internodes of *Filisparsa*, var. *pennata*, Norman, hardly seem to be *T. irregularis*. On the anterior surface there is often a good deal of irregularity in the position of the zoöcia, and the outer zoöcium shows on the dorsal surface (Pl. I. figs. 1, 2, 4, 5, 14). It was placed under *Filisparsa* until the dorsal ovicell was found, and it has much in common with *Hornera*. I cannot feel that we yet know the limits of *Tervia*, for *T. globulifera*, Canu & Bassler \*, *T. pyrifer*, C. & B., *T. tumida*, C. & B., as described, have complete series as in *Idmonea*, and would not fall under *Tervia* as described by Jullien, for he says this genus differs from *Idmonea* by the presence of a certain

\* Loc. cit. pp. 790, 791, 792.

number of isolated zoecia, disposed without order on the middle of the branches between the lateral series. *Idmonea*, as we now understand it, has ovicells on the anterior surface or lateral.

Considerable numbers of zoaria may be found without any ovicells, but, after looking through a large quantity of material, my collection now contains a fair number with ovicells. Comparison is very important, as it shows that, while the ovicell may frequently occur near a bifurcation, this is by no means always the case. It may occur in the branch away from the bifurcation, and there may be one at a bifurcation and another further up quite independent. One occurs laterally (figs. 5, 6), so that it is seen from the back as well as the front. There are one or two with a rather small ovicell near a bifurcation, which also extends to the front (figs. 2, 7); on another (figs. 3, 4) the ovicell is seen on the anterior and dorsal surface, another specimen is almost identical. A similar ovicell was found by Harmer on a Queensland specimen, and on this the species *T. jellyæ*\* was described. Probably the specimen from Queensland described by Harmer had been given by me to Miss Jelly without my appreciating the importance of the ovicell, and on others from Holborn Island, given me by Professor Haswell, I find no ovicells. Although the series do not occur as much spread out as some Mediterranean specimens, this may only be because they are somewhat broken. The pores of my Mediterranean and Queensland specimens seem to be identical, so that there is no ground for retaining *T. jellyæ*, H.

The lateral ovicell (figs. 5, 6), of which only one case has been met with, is extremely interesting, for Canu and Bassler have made a genus, *Pleuronema*, principally based on the ovicell of an *Idmonea*-form being lateral, so that if fig. 5 had been found in a distant locality it might possibly have been made the type of a new genus. One specimen of *T. irregularis* has eight ovicells, some at a bifurcation, others on the branches (fig. 9).

The similarity of the ovicell and oeciostome with the anterior ovicell of several species of *Crisia* (as, for instance, *C. ramosa*) is very noticeable.

*Loc.* Naples; Capri; Villefranche-sur-Mer; Oran; Ajaccio, 280 met.; Genoa; Adriatic; Bay of Biscay, 135, 166, 240 met.; Madeira; Azores, 318 met.; between Fayal

\* "Poly. of the 'Siboga' Exped.," pt. 1, 'Siboga' Exped. xxviii. a, p. 143, pl. xi. figs. 1-3 (1915).

and Pico, 50-90 fath.; Cap Blanc, 235 met.; Cabezos; Santander; Brit. East Africa; Holborn and Broughton Islands, Bowen, Port Denison (Queensland).

*Tervia discreta*, Jullien.

*Tervia discreta*, Jullien, "Drag. du 'Travailleur,'" Bull. Soc. Zool. de France, vol. vii. pp. (4), 500, pl. xvii. figs. 70, 71 (1882).

There are some specimens of this very small *Tervia* from Faraglione, Capri, said to be from about 150 fath.

There are two zoœcia in a series as a rule, but sometimes three, and one median zoœcium here and there with very distinct boundary-lines. Branching may take place at fairly short intervals at an angle of about 50°. No ovicells have been found.

*Idmonea notomale*, Busk. (Pl. I. figs. 10-12.)

*Idmonea notomale*, Busk, Brit. Mar. Poly. pt. iii. p. 12, pl. xii. a, (1875); Seguenza, Form. Terz. Reggio. pp. 330, 371 (1880).

*Idmonea milneana*, Waters, "Ovicells of Cyclos. Bry.," Journ. Linn. Soc., Zool. vol. xx. p. 279, pl. xiv. fig. 8 (1888); Neviani, Bri. neog. Calabria, p. 232 (1900); Bri. neoz. di alcune Loc. d'Italia, pt. 3, p. 124 (1895); Bri. form. Plioc. e postpl. Boll. Soc. Geol. Ital. vol. xviii. p. 13 (1898).

*Idmonea targioni*, Neviani, Cont. alla conosc. dei Bri. foss. Ital. p. (43), 139, pl. iv. fig. 20 (1891); Bri. foss. Ital. *Idmonea*, p. 21 (1900).

This is the largest species of *Idmonea* found in the Mediterranean. The zoarium of species from Capri is about 120-145 mm. wide, and the zoœcial aperture is about 0.17 mm. Probably the largest species from the Southern Hemisphere is *I. milneana*, and at one time I considered them synonyms; however, looking at various slides from the Mediterranean and the Southern Hemisphere in my collection, I came to the conclusion that a mistake had been made somewhere, although I had repeated that on a re-examination of the two so named by Busk they seemed identical, and so the Museum slides of Busk's Catalogue were. But on my going into the question it was found that the type figured specimen of *notomale*, B., had been in the author's possession until the time of his death, and has only comparatively recently come to the Museum; whereas the specimens returned by Busk as *notomale* and *milneana* are identical, and the one, 75.5. 29. 19, marked *notomale*, Porcupine, Mediterranean, I am convinced is not from the Mediterranean, an interchange having taken place while in Busk's hand between specimens from



Patagonia or elsewhere—and *notomale* is a Mediterranean form, while *milneana* is a Southern Hemisphere form.

*Idmonea notomale* has the right and left series well separated, and Busk says "the series on either side are separated by a wide interspace," and what he figures pl. xii. *a*, as spreading between the series, is the ovicell, which is often a narrow band along the median line, hardly at all raised. The dorsal surface is, as a rule, much hollowed out, and the outer zoœcia are usually visible on the dorsal surface. The zoarium is frequently contorted, so that the older part may be seen full face, while the next branches are seen laterally, showing much the same structure as *I. contorta*, B., which is allied.

From between Fayal and Pico (Azores), 50–90 fath., 'Challenger,' there are several specimens of a very similar *Idmonea*, with smaller dimensions, which seems to be the *I. petri* as described by Canu and Bassler\*, and from the same dredging *I. bifrons*, Waters, is common, looking like a double *Idmonea*, recalling at first *I. notomale* growing back to back. Examining one surface, which we may call the frontal, there are series of zoœcia on each side of the median line; turned over what is now the dorsal surface has just the same appearance, and we hardly know whether to consider it as *Idmonea* or *Entalophora*.

Jullien and Calvet have described *I. bifrons*, W., as *Biidmonea fayalensis*†, Hagenow‡ considered that Goldfuss had described *Idmonea disticha* as like a double *Idmonea*, and has separated from Goldfuss's material of *I. disticha* the the double one as *disticha* and those with a dorsal surface as *dorsata*, Hag. The description and figures given by Goldfuss do not show that it was double. If it has to be separated from *Idmonea* it then falls into *Bisidmonea*, d'Orb.§, a genus made for a Jurassic (Bathonian) fossil.

We thus have the same structure as *Idmonea*, *Bisidmonea*, d'Orb., *Biidmonea*, J. & C., *Tubigera*, d'Orb.

At one time I thought that I had found *I. petri* from the Mediterranean, but, as there is some doubt, it is omitted. The figure and description of d'Archiac || might well belong to other species, as well as *petri*, though, having several figures of Canu and Bassler, we can take *I. petri* as the species

\* *Loc. cit.* p. 781, pl. 139. figs. 1–13 (non pl. 137) (1920).

† Campagne de l'Ifirondelle, p. 158, pl. xviii. figs. 3 *a*, 3 *b* (1903).

‡ Bry. Maastricht. p. 30, pl. ii. fig. 8 (1851).

§ Pal. Franç. p. 720, pl. 762. figs. 10, 11, 12.

|| "Fossiles des Environs de Bayonne," Mém. Soc. Géol. de France, ser. 2, vol. ii. p. 196, fig. 11 (1846).

described by them. Two important characters usually occurring are the hollow dorsal surface and the considerable contortion of the zoarium, so that the plane may be changed with a new branch as in *I. notomale*. Apparently it is a widely spread species in the European Tertiaries, and I have recently found it from the Vicentine Bartonian in Brendola, Montecchio Maggiore, and Creazzo.

*Loc.* Capri, Oran (Algiers).

*Fossil.* Pliocene, Postpliocene of Italy. I do not give full lists of the later Italian Tertiaries, as at first intended, as there is so much uncertainty until the ovicells are studied.

*Idmonea atlantica*, Johnston.

(Pl. I. figs. 11, 12 ; Pl. II. fig. 9.)

*Idmonea atlantica*, Johnston, British Zoophytes, ed. ii. p. 278, pl. xlviii. fig. 3 (1847).

The typical *I. atlantica*, as described and figured by Johnston, is narrow and tapers to the end, which is usually the case in specimens from the Mediterranean and from distant localities. The bifurcation is slightly rounded at the base, then the separation is at a moderate angle, after which, in the most typical specimens, the branches do not spread out far, but continue somewhat parallel, as Harmer has called it a tuning-fork shape. The branches in the older parts are usually somewhat rounded on the dorsal surface, but elsewhere flat or somewhat concave. The parallel branches are shown in Busk's Brit. Mus. Cat. (pl. ix., figure, natural size, right bottom corner: the figures are unnumbered). The two figures at the top have short internodes, and I do not think they are *I. atlantica*. Hincks shows the same parallel growth, as also does Busk in 'Polyzoa of Norway and Finland' (pl. i. fig. 6), and here he says "in external habit it much resembles *I. radians*, Lam."

In typical specimens in my collection from various places the zoarium is long and usually straight, with very long internodes (one from Naples is 15 mm. long), the ovicells are long and very much raised, occupying the width of the zoarium, with the series only just showing—they are not usually near to a bifurcation; but besides the more typical form there are frequently zoaria, with short triangular ovicells, which at one time it seemed would have to be separated from the more typical ones.

On one specimen there is a rather long ovicell, just below

a bifurcation and a similar one just above another bifurcation ; in a second there is below each of two of the bifurcations a short ovicell ; still another has two long ovicells on one internode. I have not found any œciostomes on the elongate ovicells, but on the shorter ones near a bifurcation there is a curved tube distal to the series. This is the same as in *I. radians* and *I. parasitica*, Busk. Much stress has been laid upon the position of an ovicell, and it is often stated it grows at a bifurcation, which is somewhat misleading, for in this and some other species it may grow in any position.

*Idmonea atlantica* has much in common with *I. radians*, both have long straight branches showing a tendency to a somewhat parallel growth, both have a large and long ovicell of similar shape in a similar position. Canu and Bassler have made a genus *Mesonea* for the latter, based on the large dorsal pores called by Canu and Bassler tergo-pores. D'Orbigny had made the genus *Crisina* for *Idmonea* forms with large dorsal pores, and Canu and Bassler now make *Crisina normaniana*, d'Orb., the type of *Crisina*—Pergens \* having described and figured a lateral ovicell. The difference in the dorsal surface is important, and it may be sufficient upon which to found a genus, but we have not yet got certain proof.

The specimens of *Idmonea parasitica*, Busk, just referred to, grows inside a mass of *Entalophora intricaria*, B., with the zoœcia regular and not as straggling as shown by Busk. It is just the same size as *I. radians*, the ovicell is in the same position and the same size, and in both the œciostome is a curved tube distal to a series ; on the other hand, there are no large pores either on the dorsal or anterior surface, so that, although similar in all other respects than the pores, the one would be considered *Idmonea*, the other *Crisina*. These puzzles show that classification still requires much study.

The important point is the similarity, and the question of names is of secondary importance.

The specimen from Naples, which I considered was *I. marionensis*, B., certainly corresponds with Busk's figure, but now it appears to be *atlantica* and there does not seem any reason for comparing it with *Crisina hochstetteriana*, Stoliczka, which is probably *I. radians*, Lamk., and, in fact, *marionensis* does not seem to be a good species.

\* Rev. des Bry. du Crét. fig. par d'Orb. p. 344, pl. xii. fig. 3 (1887).

A specimen from lat.  $77^{\circ} 55' N.$ , long.  $53^{\circ} 16' E.$ , has the *atlantica* growth, but the distance between the series is about 0.9 mm., and the zoöscia are somewhat longer than is usual. There is no ovicell.

A specimen from Naples which I had labelled *I. concava*, Rss. (Pl. II. fig. 11), may be a form of *atlantica*, and has a long central ovicell but very little raised.

*Loc.* Naples, Capri, Oran, N. Atlantic, and many other places, but at present I hesitate to check the synonyms.

*Fossil.* Italian Tertiaries.

*Idmonea meneghinii*, Heller. (Pl. II. figs. 2, 4.)

*Idmonea meneghinii*, Heller, "Die Bry. des Adriat.," Verh. der k.-k. zool.-bot. Ges. Wien, vol. xxix. p. 120, pl. iii. figs. 6, 7 (1867); Busk, Brit. Mus. Cat. pt. iii. p. 14 (1876); Waters, "Bry. of the Bay of Naples," Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 270 (1870); Seguenza, Form. Terz. Reggio, p. 380 (1879); Calvet, Bry. Mar. de Corse, p. 41 (1902).

*Idmonea erecta*, Calvet, Bry. Mar. de Cete, p. 82, pl. iii. figs. 5, 6 (1902).

This species occurs from Naples and Capri, but not abundantly. In some respects it resembles *I. atlantica*, though the branches are short, diverging at a moderately large angle. On a specimen from Capri four ovicells occur, which are not absolutely identical (fig. 2). In neither is the ovicell very long and does not include any zoöcia, in two cases reaching right across the zoarium (*a*, *c*) spreading between two series. In the one (*c*) the oöciostome is not directly touching any zoöcium, but is not far from the inner zoöcium of a series, and has a spread-out nearly round funnel (*c*), while the other (*a*) has a plain tube distal to, but close up to, a zoöcium. The third ovicell (*b*) is situated entirely on the left side of the median line, and has a curved oöciostome directed proximally. The fourth ovicell is at the end of the zoarium rather on one side. The tube seen at the end is not an oöciostome, and the ovicell is immature. Neither the oöciostome on (*a*) or (*b*) are readily made out, but I believe my description is correct.

Now, *I. meneghinii* and *I. triforis* are very similar in the branching and in the appearance of the series, but *meneghinii* is larger and has about five zoöcia in a series instead of three. *I. triforis* is considered by Friedl as only a variety, and no doubt the possibility has occurred to all of us, before the ovicells were known; but the most important difference is that the larger form has the frontal ovicells as now

described, whereas *I. triforis* has ovicells \* enclosing a series. This very remarkable ovicell has only been seen on one specimen, and it is to be hoped that others will turn up. While the general characters are so closely similar, it would be difficult to place them in different genera, on account of the ovicells, and we must wait for further light on this point.

There are some small basal specimens, which, from the size of the zoëcia and the distance apart of the series, are no doubt *I. meneghinii*, in which the striated dorsal surface has over the lower part an overgrowth with elongated pores (fig. 10), so that this part is like *Crisina*.

Canu † refers to a similar growth in *Idmonea coronopus*, saying that the "canaux de renforcement" are heaped up on the dorsal surface of the old zoëcia, and sometimes the substratum is detached by fossilization. Smitt ‡ speaks of abortive zoëcia in *I. atlantica*, and on that account hesitates to accept the genus *Crisina*. Pergens § says that in *Idmonea carinata*, Rss., a section of the upper part shows only four canals de renforcement, whereas there are about forty in the lower part. Harmer ||, speaking of *I. atlantica*, says the stalk of the colony becomes thickened by secondarily developed calcareous tubes, the "canaux de renforcement" of Pergens, and (page 126) he speaks of a secondary thickening which grows in a distal direction, but does not extend far up the colony. I have seen it beyond the second bifurcation.

The two inner zoëcia of *I. meneghinii* are usually closely attached and the others more separated, as in many species of *Idmonea*, and therefore *I. erecta*, Calv., is considered a synonym. The measurements of the two are fairly similar.

Loc. Naples, Capri, Nice, Cette, Marseilles, Lessina and Lissa (Adriatic), *Hell.*; between Fayal and Pico (Azores), 50-90 fath. ('Challenger').

*Fossil.* Italian Tertiaries.

### *Idmonea triforis*, Heller. (Pl. II. fig. 1.)

*Idmonea triforis*, Heller, Die Bryozoen des Adriat. p. 120 (1867); Busk, Brit. Mus. Cat. pt. iii. p. 115 (1875); Waters, Bry. from the

\* "On some Ovicells of Cycl. Bry.," Journ. Linn. Soc., Zool. vol. xx. pl. xiv. fig. 2 (1888).

† "Bry. des Terr. Tert. des Environs de Paris," Ann. Paléont. vol. ii. p. 128.

‡ Floridan Bry. pt. i. p. 7; Krit. Fört. of Vet.-Akad. p. 44 (1866).

§ "Rev. des Bry. du Crétacée fig. par d'Orbigny," Bull. Soc. Géol. de Fr. p. 312.

|| 'Siboga' Exped. p. 138 (1920).

Bay of Naples, p. 271 (1879); Seguenza, Formaz. Terz. Reggio, pp. 209, 297, 371 (1879); Neviani, Foss. Ital. Idmon. Boll. Soc. Geol. Ital. vol. xix. pp. (12), 21 (1900).  
*Idmonea meneghinii*, Waters, "Ovicells of Cyclos. Bry.," Journ. Linn. Soc., Zool. vol. xx. p. 278, pl. xiv. fig. 2 (1888).

This is described by Heller as only differing from *I. meneghinii*, Hell., in having the branches smaller, and without having various specimens for comparison such a description is difficult to follow, but now I have several of both and have seen co-types. The specimen described by me as *I. meneghinii* \* with very remarkable ovicells is undoubtedly *I. triforis*, and almost exactly corresponds with the specimen now figured.

Until this paper was completed only the ovicell of the one described specimen was known, but another one has just been discovered in my Capri material—in which, however, the large globular ovicell is smooth, enclosing a series; whereas the one previously described was bagpipe-shaped with openings reminding us of the ovicells of *Hornera*. Perhaps the Capri specimen is in a younger stage, or specific separation may be necessary.

If it were not for the remarkable ovicell it might seem justifiable to consider this as only a smaller form, and Friedl speaks of this as var. of *I. gracilis*, Meneg., considering *I. meneghinii* as a synonym of the latter. This species is referred to (p. 11) under *I. meneghinii*, and the dorsal superimposed layer is mentioned.

*Loc.* Naples, Capri, Oran, Adriatic (Hell.); between Fayal and Pico.

*Fossil.* Italian Upper Tertiaries.

*Idmonea serpens*, Linn.? (Pl. II. figs. 3, 4, 5, 8, 11.)

See *Idmonea serpens*, Hincks, Brit. Mar. Poly. p. 453, pl. lxi. fig. 2.

This is what has been understood by many authors as *I. serpens*, though other things have also been called *serpens*. It is an adnate strap-shaped form, and it does not seem that adnate and erect forms can be separated generically and sometimes not specifically, nor do I see that these forms can be put under *Tubulipora*, although the early stages are similar. Forms, however, which continue for a long distance of the same width can be separated from those which rapidly expand, even though we may sometimes find difficulties. The ovicells occur on the median line, and in the specimens figured (8, 11) near a bifurcation, not enclosing any zoœcia.

\* *Loc. cit.* pl. xiv. fig. 2 (1888).

The œciostome, though not touching, is near to the zoœcium, and is wide with only a short tube, and in the specimen (fig. 8) the ovicell turns over on the dorsal surface on both sides, the boundary being seen as a small arc at the back.

It occurs frequently on the *Posidonia* thrown upon the Mediterranean coast, as well as on other sea-weeds. It agrees very closely with *I. meneghinii*, H., and perhaps should be so named—the latter occurs at much greater depths and is free and erect.

For special reasons *serpens* will be considered more fully when *Tubulipora* is dealt with, as *T. serpens* seems to have been used as the name for at least four species, and it is only provisionally mentioned now; subsequently it is hoped to bring *T. serpens* out of its present muddle.

The primary disk of *I. serpens* measures about 0.16 mm. across, and there seems to be an approximate relationship between the size of the disk and the size of the zoœcia, the first being the wider. The size of the disk of *T. liiacea*, Harmer, is about 0.1 mm.; *T. dilatans*, John., 0.09–0.1 mm.; *T. lamourouxii*, Aud., 0.12 mm.; *T. pulchra*, MacG., 0.12 mm.; *T. ventricosa*, B., 0.28 mm.; *T. plumosa*, Th., 0.28 mm.; *T. incrassata*, Sm., 0.15 mm.; *Lichenopora radiata*, Aud., 0.11 mm.; *Diastopora*, 0.1 mm.

Loc. Naples, Rapallo, Mentone, San Remo, St. Raphael.

*Idmonea philippæ*, Harmer. (Pl. II. fig. 6.)

*Reptotubigera philippæ*, Harmer, "Polyzoa of the 'Siboga' Expedition," Ento. Otenost. & Cyclos. pt. i. p. 120, pl. x. fig. 9 (1915).

*Platonea philippæ*, Canu & Bassler, North American Early Tert. Bry. p. 760, fig. 248 (1920).

From the Mentone laminarian zone, on *Posidonia* thrown up on the coast, I found a specimen which certainly seems to be this species. It was longer than the part figured, the zoœcia show considerable irregularity in number being usually three in a series, but sometimes three or four, with most irregularity near the ovicell. It has much in common with *I. serpens*, and it looks as though it might have arisen from being obliged to grow upon very narrow stalks or the broken strips of *Posidonia* leaves.

In *I. serpens* and other creeping forms there is in places an attachment-layer, often thrown out for a short distance, and it may happen to grow similarly on each side of the zoarium (fig. 3). This is what Gregory calls a wing-like selve in his *Idmonea alipes*\*, and which Harmer (*loc. cit.*)

\* Cat. B.M. Cretaceous Bryozoa, vol. i. p. 152, pl. viii. figs. 2, 3, 4 (1899).

speaks of as a basal lamina ; it also occurs in many other Cyclostomata, but in all that I have examined it consists of small parallel tubes, whereas Harmer mentions porous areas. Is it possible that these are formed by local irregularities of the tubes, or is it to be compared with the closed areas which Busk figures on the dorsal surface of *Idmonea fenestrata*, B.\* ?

The ovicell is wide, spreading to each side of the zoarium ; also in *I. serpens* we may have an ovicell spreading across the zoarium. As showing such ovicells I give a figure of an *Idmonea*, probably an abnormal *I. notomale* with three broad ovicells, but the fragment is difficult to determine. The shape of the ovicell does not seem to require us to place it in a new genus.

There is also a piece of *I. philippæ* from Capri without ovicells.

## EXPLANATION OF THE PLATES.

## PLATE I.

- Fig. 1.* *Tervia irregularis*, Meneghini,  $\times 12$ . Dorsal surface, showing two ovicells. From Capri.  
*Fig. 2.* Ditto,  $\times 12$ . Dorsal surface near a bifurcation. From Capri.  
*Fig. 3.* Ditto,  $\times 12$ . Anterior surface. From Capri.  
*Fig. 4.* Ditto,  $\times 12$ . Dorsal surface of fig. 3.  
*Fig. 5.* Ditto,  $\times 12$ . Dorsal surface, showing lateral ovicell. From Capri.  
*Fig. 6.* Ditto,  $\times 12$ . Anterior surface of fig. 5.  
*Fig. 7.* Ditto,  $\times 12$ . Anterior surface of fig. 2.  
*Fig. 8.* Ditto,  $\times 12$ . Dorsal surface. From Capri.  
*Fig. 9.* Ditto,  $\times$  about 2. Showing the position of nine ovicells. From Naples.  
*Fig. 10.* *Idmonea meneghinii*? Dorsal surface, showing an additional layer in which are large pores, nematopores. Between Fayal and Pico (Azores).  
*Fig. 11.* *Idmonea notomale*, Busk. Anterior surface with ovicell. From Capri.  
*Fig. 12.* *Idmonea atlantica*, Johnst.,  $\times 12$ . With ovicells. From Capri.  
*Fig. 13.* Ditto,  $\times 12$ . Lateral view with ovicell. From Capri.  
*Fig. 14.* *Idmonea notomale*, B. Dorsal surface. From Capri.

## PLATE II.

- Fig. 1.* *Idmonea triforis*, Hell.,  $\times 12$ . From Naples.  
*Fig. 2.* *Idmonea meneghinii*, Hell.,  $\times 12$ . Showing four ovicells on the colony, (a) is at a bifurcation, (b) is lateral, (c) is in the middle of a branch, (d) is on one side of the median line : (a) has the oecioctome distal to a series, but it starts from the

\* Crag Polyzoa, pl. xv. fig. 105.



base of the inner zoecium ; (b) has the oecioostome proximal to the zoecia ; (c) has a funnel-shaped oecioostome fairly near to a series ; (d) the oecioostome is not visible, the projecting tube is zoecial. There has been hardly any restoration, though some of the ends of the zoecia are broken. From Capri.

Fig. 3. *Idmonea serpens*,  $\times$  about 2. From St. Raphael.

Fig. 4. *Idmonea meneghinii*, Hell.,  $\times$  12. Ovicell. From Naples.

Fig. 5. *Idmonea serpens*, Diaz. Showing selvage.

Fig. 6. *Idmonea philippæ*, Harmer,  $\times$  12. From Mentone.

Fig. 7. *Idmonea* sp.,  $\times$  12. With three broad ovicella.

Fig. 8. *Idmonea serpens*,  $\times$  12. From St. Raphael.

Fig. 9. *Idmonea perhaps atlantica*, I. From Faraglione, Capri.

Fig. 10. *Idmonea serpens*,  $\times$  12. With two oecioostomes. From Naples.

Fig. 11. *Idmonea "concuva,"*  $\times$  12. From Naples.

The figures are only sketches, so as to reduce expenses, but it is hoped that they fully explain the structure.

## II.—*New Ants from Australia.*

By W. C. CRAWLEY, B.A., F.E.S., F.R.M.S.

[Concluded from vol. ix. p. 449.]

### *Solenopsis* CLARKI, sp. n.

♀ (major). Length 1·8 mm.

Yellow ; teeth of mandibles dark brown, and an indistinct band across the apical third of gaster brown. Body with moderately long yellow pilosity. Antennæ and legs abundantly provided with stiff erect hairs. Clypeus with long hairs.

Head as long as broad, the sides parallel up to the hinder third where they converge slightly, forming rounded occipital angles ; occipital border widely concave. Eyes small, about 0·45 mm. in longest diameter, placed at the anterior one-quarter of sides of head. Mandibles with four teeth, the apical large, the two following less large and subequal, the third set far back and small. Clypeus of ordinary form, the carinæ ending in small teeth. Frontal area deeply impressed. Scapes reach just beyond two-thirds of the distance from their base to the occiput. The 2-jointed club longer than the rest of funiculus ; the remaining joints of funiculus all broader than long and subequal, except the joint next to the club, which is longer and broader.

Thorax in profile slightly incised at mesoepinotal suture. Base of epinotum feebly convex, more than twice as long as

the declivity, which is concave and bordered. Pronotum about once and a half as long as broad, the shoulders rounded, the sides gradually narrowing in a gentle curve to just before the suture, where they narrow abruptly and form a deep constriction. First node from above a little broader than second, broader than long, almost straight in front and behind, the sides rounded; the second node rounded, slightly broader than long. In profile the first node is higher than the second, slightly higher in front than behind, not greatly narrower at apex; the second more or less globular.

Shining; mandibles smooth, grooves continuing the intervals between the teeth; head with scattered shallow circular punctures. Back of thorax and nodes with a few more superficial punctures, the rest smooth.

♂ (minor). Length 1.4 mm.

Entirely pale yellow, except the teeth of mandibles. Head longer than broad, the sides almost parallel, converging very slightly towards the occiput, which is concave. Eyes smaller and placed nearer the base of mandibles. Thorax in profile flatter, mesoepinotal suture deeper. First node proportionately higher and narrower. Otherwise like ♂ major.

Byford, W.A. (Clark, no. 171).

Types W. C. C. coll.

The first species of *Solenopsis* found in Australia (except the cosmopolitan *geminata*, var. *rufa*, Jerd.) was described by Forel in 1897 under the name of *belisarius*. The ♂ of this species, which is found in S.W. Australia, is entirely without eyes.

*Aphænogaster* POULTONI, sp. n. (Figs. 11 & 12.)

♂. Length 4.3 mm.

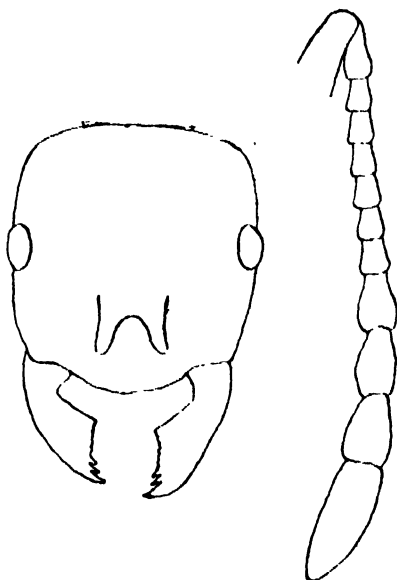
Dark castaneous, legs paler.

Head more or less rectangular, very slightly broader than long, widest at eyes; it does not narrow at occiput, where the shoulders are very square; in front at base of mandibles it is only slightly narrower than at occiput. There is no semblance of a neck, and the reflected border is minute. Eyes placed just behind middle of sides. The scapes extend less than one-quarter of their length beyond the occipital border. Joints of funiculus broader and shorter, and club more thickened, than in *longiceps*.

Elevation of thorax pronounced, extending to middle of the space between the anterior border and the incision. Spines mere teeth, and base of epinotum convex. Pedicel

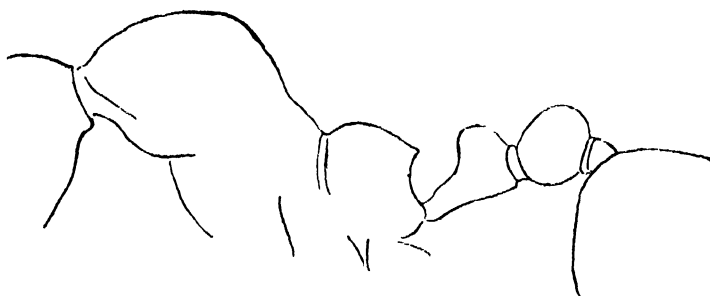
as in *longiceps*, Sm., with the exception of the first node which in profile is distinctly less narrowed at apex.

Fig. 11.



Head and antenna of *Aphænogaster poultoni*.

Fig. 12.



Profile of *Aphænogaster poultoni*.

Under the head is a scanty beard, less abundant than in *barbigula*, Wh., according to the description.

Mandibles finely striated as in type. Cheeks smooth and

shining, the space between frontal carinæ and eyes alone being striated, with the exception of a few very fine lines on the frontal carinæ. Generally the sculpture comes between that of *longiceps* and *pythia*. There is no sign of striæ between the epinotal teeth.

Beenup, W.A. (Clark, no. 164).

Type W. C. C. coll.

On re-examination of some ants taken by Professor Poulton at Perth in 1914, I found that there were among them three specimens of this form. There can be no doubt that these specimens agree with Mr. Clark's, though the head is possibly somewhat less square behind.

I have recently re-described Smith's type of *Aphenogaster longiceps* in the British Museum, and give the results below, followed by some notes on *pythia*, For., and *barbigula*, Wh.

*A. longiceps*, Smith. (Figs. 13 & 14.)

Type.

♂. Length 6.0 mm.

Dark castaneous. A short scanty pilosity on body. No beard under head.

Head longer than broad, widest just behind the eyes, narrowing halfway between eyes and occiput into a distinct neck and reflected occipital border; considerably narrower at base of mandibles than at eyes. Eyes placed just in front of middle of sides. The scape passes the occiput by more than one-quarter its length. Joints of funiculus long and narrow, all much longer than broad. Club only slightly thickened.

Elevation of thorax moderate, and does not extend as far as the centre of the dorsum between the anterior border of pronotum to the incision; from its highest point it falls in a feebly concave curve to the incision, which is deep. Spines almost horizontal, nearly as long as their interval. First node from above nearly twice as long as broad, only a little more than one-half as wide as second node; in profile it is considerably narrowed at apex.

Mandibles finely longitudinally striated. Longitudinal striæ on cheeks and between the antennal sockets and eyes. A few very fine ones at sides of frontal carinæ. Sides of mesonotum and epinotum rugose. Mesonotum longitudinally striate just before the meso-ePINOTAL suture. Base of epinotum transversely striate, declivity between the spines smooth and shining with a few faint transverse lines.

The examples of *longiceps* from Healesville, Victoria, 1913

*pinota*, Forel), received from Mr. H. A. Arnold (*vide* Forel, *Arkiv. för Zoologi*, ix. 16, 1915, p. 75) are uniformly darker in colour than the type, but in all other respects agree perfectly.

Fig. 13.

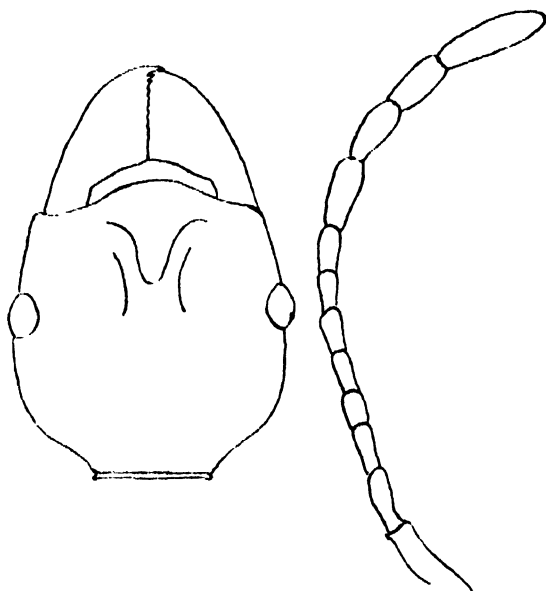
Head and antenna of *Aphanogaster longiceps*, Sm., type.

Fig. 14.

Profile of *Aphanogaster longiceps*, Sm., type.

*A. pythia*, For.—Wheeler (*Tr. Roy. Soc. S. Austr.* xl. 1916) says the head is hardly longer than broad, and broader behind than in front, with less rounded posterior borders than in *longiceps*; antennæ shorter, though scape passes the

occiput by nearly one-quarter its length, funicular joints shorter; epinotal spines shorter, much shorter than their distance apart at base, and directed more upward; petiolar node rising less abruptly from the peduncle. Colour usually paler and more yellowish than in *longiceps*.

The specimens in my collection from Mackay, Queensland, named by Forel, agree in the main with the above, but the head is as broad as long, very similar to that of *poultoni*, but slightly narrower in front. The funicular joints are not quite so long and thin as in the type of *longiceps*, but more so than in *poultoni*. The spines, besides being shorter than in *longiceps*, are directed more upward and outward. The sculpture, as Wheeler says, is less pronounced than in *longiceps*.

*A. barbigula*, Wheeler (*l. c.*), is distinguished from *longiceps* and *pythia* principally by the absence of spines, their place being taken by small teeth, and by the shape of the head; from race *poultoni* by the shape of the head (which is of the *pythia* type) and the more scanty beard.

Otherwise *barbigula* (according to the description and figures) is very like *poultoni*.

An account of the appearance of the nests of *poultoni* is given by Poulton in Ent. Mo. Mag. ? May, June 1922.

Clark says that it nests mostly under stones, the actual nest being underground with two or three small tunnels leading downwards.

#### *Crematogaster PERTHENSIS*, sp. n.

♂. Length 3.3–4.0 mm.

Varies in colour from dark castaneous brown, with the thorax less dark than head and gaster, and the apical half of the latter nearly black, to castaneous, with the gaster dark brown. The ♀ major is the darkest in colour, and has a black patch on the occiput.

Head broader than long, as broad in front as behind, sides feebly convex; occipital border very feebly concave. Mandibles with four teeth, clypeus depressed in front. Eyes placed just behind middle of sides, scape barely extends beyond occipital border. Antennal club 3-jointed, the apical joint slightly longer than the two others together; joints 2–5 of funiculus as broad as long.

Pronotum broad, the anterior angles rounded. Mesonotum longer than wide, pro-mesonotal suture distinct, mesoepinotal suture deep.

Base of epinotum shorter than declivity, broader than

long, declivity flat. Epinotal spines nearly horizontal, as long as half the width between them. First node slightly broader than long, equally broad in front and behind, the sides evenly convex; second node as wide as the first, divided into two discs.

Mandibles evenly striate throughout their whole length. Clypeus striate in front and at sides, smooth in the middle and posteriorly. Cheeks and sides of head longitudinally striate as far as the posterior border of eyes; centre of head and occiput smooth and shining (in the ♂ major there is a faint striation up to near the occiput; in the ♂ minor the head is altogether more feebly striate).

Whole of dorsum of thorax coarsely longitudinally striate, including the space between the spines. Declivity smooth and shining. There is also a ground-reticulation between the striae of the thorax. In the ♂ minor the striation is less regular and the reticulation more evident. First node shining, superficially reticulate; discs of second node smooth and shining. Gaster smooth and shining.

Antennae and tibiae with erect hairs. Whole body abundantly supplied with a long pilosity. Head in addition has short adherent pubescence.

♂. Length 4.5 mm.

Black; antennae yellow-grey, mandibles testaceous; legs testaceous brown. Wing-nervures yellow-brown.

Body covered with a moderately long grey pilosity. Tibiae with erect hairs.

Mandibles placed wide apart, their tips just meeting when closed, narrow, with three teeth, the innermost almost obsolete. Clypeus broad, moderately raised in centre, the anterior border feebly concave, almost straight. Frontal area impressed. Head broader than long, broadest just behind the eyes, which are prominent and placed slightly in front of middle of sides. The curve of the back of head from eye to eye describes almost a half-circle. Scape almost twice as long as broad and nearly twice as long as the first joint of funiculus, which is globular; the second longer than broad, the third as long as broad, the remainder increasing slightly in length and decreasing in breadth.

Thorax very large, high, and rounded. Base of epinotum about as long as declivity, which is rounded, a blunt projection at each side. From above both nodes are broader than long, the first twice as broad, the anterior border widely concave, sides parallel, the second wider, more than twice as broad as long, the sides rounded. In profile the anterior border of

the first is widely concave, the second higher than the first.

Mandibles striate with a few grooves. Head matt, the centre of clypeus, the frontal area, and a strip extending thence to the ocelli moderately shining. Rest of head longitudinally roughened. Thorax similar, but more shining. Base of epinotum faintly longitudinally striate, the declivity smooth; nodes almost entirely smooth. Gaster smooth and shining.

Genitalia: whole organ short and broad; stipes blunt, the tip abundantly pilose; volsella flat and thin, the lateral process opposing a concavity in the organ. Stipes, volsellæ, and sagittæ subequal in length.

Perth, W.A. (*Clark*, no. 36).

Types W. C. C. coll.

*Crematogaster rufotestacea*, Mayr.

♀ (hitherto undescribed). Length 7.5 mm.

Head dark brown, thorax less dark, legs yellow, gaster bright castaneous. Pilosity more abundant than in the ♂. Wings tinged with yellow.

Club of antennæ 2- or 3-jointed (2-jointed in ♂), apical joint very slightly longer than the other two taken together. Scape barely reaches the occipital border. Mandibles with five teeth (only four in ♂).

The clypeus, which in the ♂ (as pointed out by Forel, *Rev. Suisse Zool.* x. 2, 1902, p. 412) has its anterior border produced in a bidentate lobe, has a similar lobe, but merely concave. Epinotal spines mere teeth.

Mandibles striate; clypeus striate at sides only. Striation of head as in ♂, but coarser. Thorax smooth and shining, petiole striate at sides.

♂ (hitherto undescribed). Length 4.0 mm.

Brownish black; tip of gaster brown; mandibles, clypeus, and legs yellowish brown, tarsi palest; antennæ pale yellowish grey. Nervures of wing yellow.

Mandibles long and narrow, with three teeth. Clypeus high and rounded, the anterior border with a narrow rounded projection. There is a short depression between the clypeus and the anterior ocellus.

Head broader than long, eyes large, placed in front of the middle of the sides, of which they occupy more than one-half. Scape as long as the first two joints of the funiculus, the first joint broader than the scape, longer than broad, second



and third equal, narrow, fourth and fifth equal, broader, the remaining joints increasing in breadth and thickness up to the apical, which is nearly as long as the two preceding together.

Epinotum with two blunt projections. First node longer than broad, the sides parallel, the second broader, broader than long, with a small tooth at each side.

Smooth and shining; mandibles punctured, head finely and sparsely striate, with a few punctures; thorax smooth and shining, the apical border and sides of scutellum striate. Declivity and sides of epinotum sparsely striate. First node irregularly striate; gaster smooth and shining.

Body with a yellowish pilosity, fairly abundant.

Perth, W. Australia (*J. Clark*, no. 26).

Types W. C. C. coll.

*Pheidole ampla*, Forel, race PERTHENSIS, st. n.

♂. Length 5.0 mm.

Colour darker than type. Borders of mandibles, clypeus and cheeks, and a patch on the front, dark brown, rest of head castaneous red. Thorax and petiole darker than head, gaster dark brown.

Mandibles with a straight edge terminated by two large teeth; clypeus flat, with a deep incision in anterior border, but without a distinct central carina. Frontal area impressed, triangular.

Head 2.1 mm. long, 2.0 mm. broad, sides subparallel, broadest just behind centre; occipital groove very deep. Scapes do not reach to half the distance from their base to the occiput.

The mesonotum has a feeble transverse impression, less distinct than in var. *mackayensis*. Epinotal spines as long as half the distance that divides them. Second node more than twice as broad as long, with a prominent conule at each side.

Mandibles with a few coarse striæ at base, and sparsely punctured.

Clypeus with one or two longitudinal ridges. Cheeks and anterior half of head with regular longitudinal raised striæ in ridges, similar to, but more prominent than in var. *mackayensis*, the spaces between them smooth. Occipital lobes with striæ curving outwards from the central impression. Rest of head smooth.

Pronotum transversely and irregularly striate. Epinotum between the spines superficially reticulate with a few lines.

First and second nodes superficially reticulate; the latter has also some longitudinal striæ at the sides. Gaster smooth and shining.

Whole body well supplied with a moderately long yellow-brown pilosity.

♂. Length 2.3 mm.

Head and gaster brown, rest of body (including mandibles) yellow-brown.

Head exactly as broad as long (broader than long in type). Scape passes the occiput by nearly its thickness. Eyes well in front of middle of sides (almost in middle in type). Mandibles with two large teeth, and a row of smaller ones behind. Sides of head slightly curved.

Mesonotum with a distinct transverse impression. Epinotal spines longer than their interval. Second node only slightly broader than first.

Mandibles widely punctured. Sides of head and cheeks with a few longitudinal ridges. A ridge continues the frontal carina to the vertex. Thorax with a few lateral striæ and one central one. First node slightly rugose, second superficially reticulate. Space between the spines superficially reticulate. Gaster smooth and shining.

Pilosity less abundant than in ♀.

♀. Length 7.0 mm.

Colour as in ♀, but thorax and gaster darker, and the black patch embracing the ocelli more distinct.

Mandibles and clypeus as in ♀. Head slightly broader than long, broadest at occiput, the sides almost straight. The scape reaches nearly two-thirds of the distance from its base to the occiput, which is feebly concave.

Spines very short. Petiole as in ♀, but conules not so acute.

Whole head with longitudinal ridged striæ, diverging round the occiput. Thorax above with ridged striæ at sides, smooth in middle, where there are a few punctures. Epinotum strongly longitudinally ridged between the spines. Base of first segment of gaster microscopically longitudinally striate.

Pilosity as in ♀.

Perth, W.A. (Clark, no. 24).

Types W. C. C. coll.

*Dolichoderus (Hypoclinea) ypsilon*, Forel, var. *NIGRA*, nov.

♂. The typical form is dark brown or black, with the mandibles and whole of legs red-yellow. The var. *nigra* is

entirely deep black and shining, The sculpture in the two forms is similar.

Clypeus deeply incised in centre (as in type). Scapes pass the occipital border by nearly half their length. The spines of the epinotum are longer than in the type, and thin off rather suddenly at their middle, where they bend more than in the type. The scale is shorter, broader, and more deeply notched.

Gaster with a similar thin golden pubescence to that of the type.

Kelmscott, W.A. (*Clark*, no. 25).

Type W. C. C. coll.

*Iridomyrmex conifer*, Forel.

♂ (hitherto undescribed). Length 5.0–5.5 mm.

Dark brown, nearly black; tarsi paler. Wings pale brown, with an iridescent tinge.

Mandibles short, pointed, edentate. Head broader than long, narrowed in front and behind, eyes large and globular, a little in front of the middle of sides of head, ocelli large. Clypeus raised in centre, and depressed just in front of the anterior border, which is feebly convex. Scapes, which are considerably longer than the second joint of funiculus, do not quite reach the anterior ocellus. First joint of funiculus one-third as long as second, which is longest, thereafter the joints diminish in length with the exception of the apical, which is a little longer than the preceding.

Thorax high and rounded, parapsidal furrows distinct, scutellum prominent. Epinotum regularly convex in both senses, the base longer than the declivity. Scale in profile short, broad at base, conical; from above transverse, more than twice as broad as long.

Genitalia extruded, stipites narrow and pointed, volsellæ very long, thin, and pointed, curved through a right angle, bearing a short blunt point on the inner side of base.

Sparsely provided with short erect hairs, almost absent on scapes and tibiæ; the whole body covered with a close yellow-grey pubescence.

More or less smooth and shining, with a microscopical reticulation.

Perth, W.A. (*Clark*, nos. 27, 34).

Types W. C. C. coll.

*Iridomyrmex exsanguis*, Forel.

♂ (hitherto undescribed). Length 2.0 mm.

Dark brown; mouth-parts, antennæ, and legs pale yellow-grey. Wings hyaline, iridescent.

Head longer than broad, eyes large, one-third of their length from base of mandibles, ocelli prominent, the pair placed wide apart on the angles of the occiput, which is concave between them. Mandibles edentate, very small and pointed. Scape a little longer than the first joint of funiculus, which is slightly longer than broad and two-thirds as long as the following joint. Clypeus raised in centre, the anterior border feebly incised. Thorax high and rounded. Epinotum flat, the base longer than the declivity.

Genitalia: stipites pointed, much longer than wide at their base; volsellæ very long, narrow, and curved downwards, with two small blunt teeth at base. The second tooth is not readily seen from above.

Body shining, superficially reticulate.

Wongang, W.A. (Clark, nos. 163, 167), ♂ ♀ ♀.

Type W. C. C. coll.

The ♀ corresponds exactly with the description of Forel, except that the scape does not extend so much as one-quarter of its length beyond the occipital border. The body is covered with a close grey pubescence. The wings are iridescent.

*Bothriomyrmex flavus*, sp. n. (Fig. 15.)

♂. Length 2.0 mm.

Entirely yellow, the colour of a small *Lusius flavus* ♂, gaster slightly darker.

Mandibles with five teeth. Maxillary and labial palpi 2-jointed. Head very slightly longer than broad, as broad in front as behind, the sides feebly convex, the occiput widely emarginate. Anterior border of clypeus feebly convex. Eyes small, consisting of about eight facets, placed just in front of middle of sides of head. Scape fails to reach occipital border by about its breadth. Joints 2-4 of funiculus subequal, as long as broad, the remainder increasing in breadth in proportion to their length with the exception of the apical, which is longer than the two preceding together. The head has a large shallow depression at the vertex.

Thorax slightly impressed at the mesoepinotal suture, which is very slight. Declivity of epinotum three times as long as the base. Scale very small.

Entirely smooth and shining. Mandibles with a few stiff hairs. Clypeus with four very long hairs and a few shorter ones at sides. Antennæ, legs, apex of gaster, and bases of segments pilose; whole body covered with a scattered pubescence.

♀. Length 2.4 mm.

Fuscous, sometimes almost black; apex of mandibles and tarsi yellow-brown, rest of legs brown. Wings iridescent, nearly twice as long as the whole body.

Mandibles with five teeth, the two apical ones large and sharp, the remainder very small and pointed. Head longer than broad, the sides slightly convex, almost parallel, the occipital border widely and deeply emarginate, so that the border is bluntly margined. Anterior border of clypeus feebly concave. Scapes flat, failing to reach the occiput by their width. Second joint of funiculus longer than broad, slightly longer than the third, which is as long as broad; joints 4-6 about as long as broad, the remainder longer than broad, the apical equalling the two preceding together. Eyes large, less than their length from the base of mandibles.

Thorax flat, as broad as head. Base of epinotum very short, the declivity flat, slightly concave in centre. Scale

Fig. 15.



Mandible of *Bothriomyrmex flavus*, ♀.

thick, moderately high, rounded at top; seen from above only slightly broader than long.

Gaster as broad as thorax, and slightly shorter.

Mandibles and clypeus with a few small scattered punctures; rest of body smooth and shining; gaster microscopically reticulate. A few short hairs on clypeus and apex of gaster. Body covered with a thin scattered cinereous pubescence.

♂. Length 2.0 mm.

Fuscous. Mandibles, clypeus, and legs dirty grey-yellow. Extreme borders of funicular joints edged with brown.

Mandibles edentate, pointed. Clypeus high and rounded in centre, the anterior border straight. Head longer than broad, narrowing behind. Eyes large and globular, close to anterior border of head. Antennæ long, reaching to beyond the node of petiole; the scapes do not quite reach the

occiput. Joints of funiculus much longer than broad, all subequal with the exception of the apical.

Thorax broader than head. Node short and thick, bluntly rounded at apex. Entirely smooth and shining.

Pubescence similar to that of the ♀. Wings shorter than in ♀.

Mundaring Weir, W. Australia (*Clark*, nos. 21, 22, 57, 124, 147).

Types W. C. C. coll.

The ♀ differs from that of *pusillus*, Mayr, in the longer head with sides more parallel, and the thicker and higher scale; and from the var. *æqualis*, For., principally in size. The ♂ differs from *pusillus* in the longer scapes and edentate mandibles, and in the joints of the funiculus which in *pusillus* are as broad as long, and in its greater size. It is also larger than the ♂ of *æqualis*. The ♀ differs from *pusillus* in the lighter colour, the longer head and joints of funiculus, and in the impression on the back of thorax.

*Bothriomyrmex scissor*, sp. n. (Fig. 16.)

♀. Length 2.4 mm.

Fuscous; the extremities of mandibles, the funiculus, and tarsi lighter. Wings iridescent, much longer than the whole insect.

Pilosity as in *flavus*.

Fig. 16.



Mandible of *B. scissor*, ♀.

Mandibles somewhat similar in shape to those of *flavus*, but with only two teeth, a large apical and a smaller sub-apical one. Beyond the teeth the mandible is scooped out so as to form a sharp cutting-edge (*vide* fig. 16).

Head exactly as long as broad, slightly narrower in front, the sides slightly convex (more so than in *flavus*), the

occipital border widely and deeply emarginate. Anterior border of clypeus very feebly convex with the suspicion of an incision in the centre. The scape fails to reach the occipital border by its width. Joints 2-5 of funiculus subequal, slightly longer than broad; the sixth shorter, the remainder lengthening and broadening, the apical longer than the two preceding together. Eyes large, less than their length from base of mandibles.

Thorax flat, as broad as head. Epinotum as in *flavus*, scale as in *flavus*, but thinner and more pointed at apex.

Gaster as in *flavus*.

Murray River, W. Australia (Clark).

Two ♀ taken with *Iridomyrmex innocens*, For., no. 146.

Type W. C. C. coll.

Comes near the race *æqualis*, For., of *pusillus*, Mayr. Differs from the ♀ of *flavus* in the shape of head, node, and particularly mandibles. The latter are characteristic, and evidently adapted for decapitating the host queen. Probably parasitic on *I. innocens*.

*Acantholepis (Stigmacros) OCCIDENTALIS*, sp. n.

♂. Length 1.9 mm.

Dirty yellow, sometimes almost entirely brown; head darker, legs paler, a brownish band on apical borders of segments of gaster. Posterior and lateral borders of clypeus lined with dark brown.

Pilosity almost nil; two pairs of longish hairs on clypeus and a few on the apical segments of gaster. Whole body with small adpressed hairs.

Head a fraction broader than long, narrowing slightly in front of eyes, which are placed just behind the middle of sides. Occipital angles rounded, the border widely concave. Frontal area large, triangular, its anterior and lateral borders clearly defined. Mandibles triangular with four teeth and a fifth obsolete between the second and third. Clypeus bluntly carinate, the anterior border rounded and having a slight flattening in the middle. Frontal carinae short, slightly divergent. Scaepae pass the occiput by nearly one-quarter of their length, they are incrassate towards apex. First joint of funiculus twice as long as second, which is hardly longer than broad, the rest all longer than broad, the apical equalling the two preceding. There is a distinct thickening towards the apex.

Pronotum epaulate, twice as wide as long. Promesonotal suture distinct and impressed. Mesonotal longer than wide, wider in front. The mesonotum forms a transverse ridge,

bituberculate, separated from the mesonotum by a feeble suture. Mesoepinotal suture deep. Base of epinotum from above transversely concave, forming two lateral angles, and wider than long, wider in front, the lateral borders raised. In profile the apex is flat, the declivity twice as long as the base, widely concave, the spines placed above the middle; they are short and sharp, hardly longer than wide at their base. Scale as broad as high, widely excised at summit; in profile very thin, feebly convex in front.

Mandibles smooth. Head almost entirely smooth; there are a few very indistinct shallow punctures on the clypeus and cheeks, and the back of head is slightly roughened. Entire thorax superficially roughened. Declivity of epinotum shining. Gaster smooth and shining.

Murray River, W. Australia (*Clark*, no. 141).

Type W. C. C. coll.

According to the description it appears to come near *æmula*, Forcl, but the scapes are longer and the clypeus carinate.

*Camponotus (Myrmophyma) claripes*, Mayr,  
race MINIMA, st. n.

♂ (major). Length 7.0 mm.

Dark brown; underside of head, front of pronotum, and antennæ ferruginous; legs pale testaceous yellow, tarsi and joints of tibiae brown; borders of segments of gaster testaceous. A few erect hairs on body, none on antennæ or legs.

Head as broad as long, broadest just behind the eyes, the sides curved and narrowing in front of eyes, which are placed behind the middle of sides. Occipital angles rounded, the border widely concave. Mandibles stout, with six teeth. Clypeus obtusely carinate, almost flat, the anterior border crenulate. Frontal carinae sigmoid, wide apart. Ocelli marked by three superficial impressions. Scapes barely reach the occipital border. Thorax constricted at meso-epinotal suture. In profile the thorax forms a gentle curve to the junction of the base and declivity of epinotum, where it descends abruptly, the angle hardly greater than a right angle. Base and declivity equal, the latter concave. Scale broad and thin, rounded at top, in profile convex in front and flat behind.

Mandibles finely punctate. Whole head microscopically reticulate. Front of head with minute shallow punctures, disappearing at occiput.

Thorax similar, but punctures less in number.

♀ (minor). Length 4.4–5.0 mm.



Brown; clypeus, cheeks, antennæ, and anterior half of pronotum testaceous yellow, legs paler yellow, sometimes almost white; tarsi and joints of tibiæ as in ♂ major. Mandibles with six teeth. Clypeus as in ♂ major, but more clearly carinate.

Pilosity similar.

Head longer than broad, the sides almost parallel, the occipital border widely concave; the scapes pass the occipital border by over one-quarter of their length.

Thorax as in ♂ major, but the base of epinotum almost knife-edged, and the angle between base and declivity less abrupt. Scale narrower and thicker.

Sculpture similar to that of ♂ major, but smoother and minus the punctures on head.

♂. Length 5.0 mm.

Almost black, including legs and scapes; funiculus and tarsi brown. Wings clear, faintly iridescent; nervures yellow. Body with scattered erect hairs.

Mandibles flat, with a blunt apical tooth. Clypeus raised in centre, with an impression just before the anterior border, which is straight. Scapes pass the occipital border by nearly half their length.

Eyes placed just behind the middle of sides. Head broad behind, the occipital border convex; in front of the eyes it is very much narrower, the sides parallel from eyes to base of mandibles.

Thorax large, pronotum depressed in centre. Epinotum in profile evenly curved. Scale small and thick.

Genitalia: squamula short and broad, stipes long and narrow, volsella broad and flat, with a rounded point turned down, the lateral process broad and short with a blunt point directed upwards. This and the volsella are armed with teeth facing each other. Sagittæ long, intermediate in length between the stipes and volsella.

♀. Length 9.0 mm.

Similar to ♂ major, but darker, with ferruginous patches on cheeks and pronotum. Wings pale brown, nervures darker.

The scapes only just pass the occipital border. Base of epinotum only half as long as declivity, the angle between them rounded and wider than in ♂ major.

Otherwise like ♂ major, except for sexual differences.

Mundaring, W.A. (Clark, nos. 117, 121, 122, 131, 135).

Types in W. C. C. coll.

*Camponotus (Myrmophyma) lownei*, Forel.

♂ (hitherto undescribed). Length 4.5 mm.

Black; mandibles, funiculi, and tarsi yellow-brown; wings yellowish.

Body with a scanty pilosity, most abundant on gaster.

Head as long as broad, widest just behind eyes, which are prominent and just behind the middle of sides. Behind eyes rounded, in front of eyes narrow, the sides slightly converging. Mandibles flat, the points crossing when closed, masticatory border edentate, sharp, with a blunt apical point. Clypeus rounded, the anterior border impressed and slightly projecting, feebly convex. Antennæ long, the scapes passing the occipital border by nearly half their length. All joints of funiculus longer than broad, 2 and 3 subequal, the rest diminishing in length to the apical.

Thorax large, scutum almost overhanging the head; epinotum convex transversely, in profile the base feebly convex. Scale from above more than twice as wide as long, straight in front, convex behind; in profile twice as high as thick, the top blunt. Squamula broad and rounded, stipes long and tapering, generally similar to the genitalia of *C. claripes*, r. *minima*, but volsella less spatulate, the lateral process thicker, and the sagittæ longer, as long or longer than the stipes.

Shining; whole body, including antennæ and legs, superficially reticulate; on the head and thorax the sculpture forms a complete network, on the scale and gaster it takes a transverse direction.

♀ (hitherto undescribed). Length 8.0 mm.

Dark brown, almost black; antennæ brown, rims of gastric segments testaceous, legs yellow, tibiæ and tarsi darker. Wings yellow-brown, nervures brown. Body with stiff erect hairs, most abundant on gaster, and also small adherent hairs.

Head very slightly longer than broad, widest at occiput, whose border is nearly straight and angles square. Sides of head straight, converging slightly in front. Eyes flat, behind middle. Scapes pass occiput by not quite their thickness. Front swollen. Mandibles thick, with five to six teeth. Clypeus bluntly carinate, the anterior border sinuate, with a blunt projection at each extremity of the curve. Frontal carinæ widely divided and sigmoid. Base of epinotum short, the curve rounded, the first third of

declivity convex, the rest concave. Scale broad and oval, bluntly pointed.

Mandibles and whole of head with scattered superficial punctures. Thorax with fewer punctures, declivity with more, gaster with none. Whole body has a reticulate ground-sculpture similar to that of the ♀.

Beenup, W.A. (Clark, no. 166), ♂ ♂ ♀.

Types W. C. C. coll.

*Camponotus (Myrmogonia) TUMIDUS*, sp. n. (Fig. 17.)

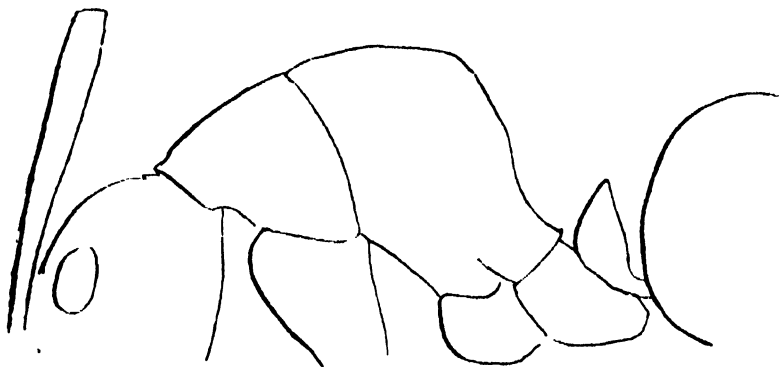
♂ major. Length 9.0 mm.

Dark brown, nearly black; funiculi, cheeks, tibiae, and tarsi russet-brown, rest of legs yellow or light castaneous.

Pilosity sparse, none on scapes or upper surface of tibiae; underside of tibiae bears a row of spike-hairs.

Head thick, vertex swollen, as long as broad, widest at eyes, which are placed just below the middle of sides; ocelli distinct. Occipital border widely concave. Mandibles

Fig. 17.



♀ minor.

Profile of thorax of *Camponotus (Myrmogonia) tumidus*.

thick and short, with six teeth; clypeus bluntly carinate, its anterior third depressed; lobe short, the anterior border crenate. Scapes barely pass the occiput. Frontal carinae short, curved, not diverging behind. Frontal groove reaches the anterior ocellus.

Pronotum broader than long, sub-bordered, evenly rounded in front. Mesonotum marked by two transverse impressions. In profile the base of epinotum is very short, the declivity descending abruptly, the first half straight, the

lower feebly concave. Scale moderately broad, the top rounded and acute.

Moderately shining; mandibles closely punctured. Clypeus with an elongate puncture at each side of lobe. Whole of head with scattered minute punctures. Thorax and gaster almost smooth. There is a reticulate ground-sculpture over the whole body, most noticeable on fore part of head, microscopical on gaster.

♂ minor. Length 7-7.5 mm.

Colour as ♂ major.

Head longer than broad, widest at base of mandibles, vertex very arched, sides subparallel, converging slightly behind eyes, which are well behind the middle of sides. Occipital border widely concave, the angles subacute. Mandibles and clypeus as in ♂ major, but the anterior border of latter distinctly convex. Antennæ remarkably long, the scapes passing the occiput by half their length; all joints of funiculus longer than broad. Angle of epinotum more pronounced and declivity more knife-edged, scale thicker and narrower at top, otherwise like ♂ major.

Byford, W.A. (*Clark*, no. 172).

Types W. C. C. coll.

*Camponotus (Myrmoturba) nigriceps*, Sm.,  
race *dimidiata*, Rog., var. *perthiana*, For.

♂ (hitherto undescribed). Length 12.0 mm.

Black; apical half of funiculus and tarsi ferruginous, rest of funiculus and legs dark brown; apical borders of segments of gaster testaceous.

Pilosity short, red-brown. Legs with short semi-adherent hairs, scapes pubescent.

Mandibles moderately long, the masticatory border edentate, the edge sharp and notched in centre. Head longer than broad, rounded behind. Clypeus with a minute notch in centre. Eyes small, placed behind the middle of sides. Scapes pass the occiput by more than half their length. Thorax long, rather narrow; epinotum broad, convex in both directions. Scale short, broad at top and slightly concave. Gaster elongate-oval. Stipites very long and thin.

Dull; microscopically reticulate with a few punctures on clypeus, cheeks, and thorax.

♀ (hitherto undescribed). Length 16.0 mm.

Colour of ♂ major, but a larger area of base of gaster castaneous red, and thorax with a broad black band down

centre of mesonotum. Pilosity less abundant than in ♂. Mandibles with six teeth. Clypeus raised in centre, but not (strictly speaking) carinate, as is the case in the ♂; anterior border notched.

Head narrower, scale thinner than in ♂ major, otherwise similar.

Wongong, W.A. (Clark, no. 162), ♀ ♂ ♀.

Types W. C. C. coll.

*Polyrhachis (Campomyrma) sidnica*, Mayr,  
var. PERTHENSIS, NOV.

♀. Differs from the type in the length of the outer spines of the scale, which are slightly longer than the inner ones; in the gaster not being matt and microscopically punctulate, but more or less smooth and shining, the superficial reticulation only being distinguishable under a magnification of 60 diameters; and in the colour of the legs, which are ferruginous in the type, and almost entirely black in the variety.

Perth (Clark, nos. 8 and 20).

Type W. C. C. coll.

III.—*Notes on the Asilinae of the South African and Oriental Regions.* By GERTRUDE RICARDO.

[Concluded from vol. viii. p. 192.]

*Philodicus rufiventris*, Bigot.

Nouv. Archiv. d. Mus. d'Hist. Nat. Paris, ser. 3, ii. p. 207 (1890).

A female described from Laos, measuring 26 mm.

Antennæ incomplete, black. Moustache black. Abdomen elongated, black, the three first segments covered with reddish tomentum. Legs blackish, tibiae reddish. Wings nearly clear.

This species is unknown to me.

*Philodicus blandus*, Wied., is said by Schiner to belong to this genus, from an unknown locality. The author describes it as a species with wholly black legs, bristles chiefly black. Moustache yellow.

Length, ♂ ♀, 15 mm.

It is probably an Oriental species, as no species from the South African region have wholly black legs.

The two following species, not belonging to the Oriental Region strictly, are added here :—

*Philodicus ponticus*, Bigot.

Ann. Soc. Ent. France, (5) x. p. 248 (1880) [*Alcimus*].

From South Kurdistan.

The above specimen, in poor condition, has been lately acquired by the Brit. Mus. Coll.

The *moustache* is white. *Thorax* and *scutellum* with white bristles. *Abdomen* much longer than the wings. *Legs* blackish, the femora reddish below, the tibiae the same, and also reddish on the outside ; all the bristles on the legs white, with the exception of a few on the tarsi, which are black ; the pubescence on legs is whitish and thick.

It seems, on the whole, to belong to this genus rather than to *Alcimus*, as the second submarginal cell is distinctly shorter than the first one, and it is very nearly allied in general appearance to *Philodicus gracilis*, v. d. Wulp, from Arabia ; both these specimens approach somewhat in colouring the typical *Alcimus* species.

*Philodicus spectabilis*, Loew.

Schrift. Ges. Freund, Nat. Moskau, 1870, lv. p. 20 (1870), et Beschreib. Europ. Dipt. ii. p. 112, 68 (1871).

A female from Amara, R. Tigris, 24. v. 1918, sent me for identification by Mr. P. A. Buxton, who has kindly presented it to the Brit. Mus. Coll., is probably the female of this species. Loew only described the male, from Turkestan, and describes the wing as entirely clear ; in this female the apex is shaded, as usual.

The length of the male was given as 19½ mm. ; this female measures 25 mm.

ALCIMUS, Loew.

Linn. Ent. iii. p. 391 (1848).

With the removal of *Asilus hospes* from this genus to *Philodicus*, this genus is restricted to the South African Region, with the exception of *Alcimus ponticus*, Bigot, described by him as from Persia or Caucasus ; one very much denuded male was all the material he had. A female from South Kurdistan in the Brit. Mus. Coll. appears to agree with his identification, and this species seems more appropriately placed in *Philodicus*.

The species are very difficult to distinguish from each other, all having very nearly allied characteristics; the specific characters seem to lie chiefly in the colouring of the bristles on the legs and on the colour of the femora and tibiæ and of their pubescence.

*Table of Species.*

1. Legs blackish .....	2.
Legs reddish .....	3.
2. Moustache black and yellow. Legs black, tibiæ paler at the base .....	<i>alamanus</i> , Wlk.
3. Femora black, reddish or yellowish below .....	4.
Femora black below, red above .....	5.
Femora black on the inner side and sometimes on the outer side .....	6.
Femora chiefly black .....	7.
4. Bristles on legs chiefly white .....	<i>tristrigatus</i> , Loew.
Bristles on legs chiefly black .....	<i>rubiginosus</i> , Gerst.
Very large species; male with four bristles on scutellum; bristles on legs chiefly white. Wings short .....	<i>brevipennis</i> , sp. n.
Fore femora only, yellowish below. Legs with dense short white pubescence .....	<i>stenurus</i> , Loew.
5. Bristles on legs and on sides of abdomen all black; only the femora with a black stripe below ....	<i>porrectus</i> , Wlk.
6. Fore legs with long white pubescence .....	<i>cinerascens</i> , Ric.
Fore femora with short black bristles below ....	<i>tæniopus</i> , Rondani.
7. Femora only red at base and apex; bristles on legs chiefly black, some white ones on fore legs.	<i>nigrescens</i> , sp. n.

*Asilus fraternus*, placed in Kertész's Cat. under this genus, is a species of *Philodicus*.

The following species are unknown to me:—

*Alcimus æthiopicus*, Bigot, from Abyssinia, and *Alcimus tigris*, Karsch, from E. Africa, both with blackish legs.

*Alcimus angustipennis*, Loew, from the Cape, a paler var. of *Alcimus longurio*, which is the same as *A. alamanus*, Wlk.

*Alcimus sericans*, Wied, from unknown locality.

*Alcimus minus* and *ludens*, Wied, from Cape and Nubia.

*Alcimus limbatus*, Macq., from Senegal.

*Alcimus alamanus*, Walker.

List Dipt. ii. p. 428 (1849), et vii., Suppl. 3, p. 506 [*Trupaneu*] (1855);  
Loew, Dipt. Süd-Afr. i. p. 134 (1860).

*Alcimus perlongus*, Wlk. Ins. Saund. Dipt. i. p. 125 [*Trupaneu*] (1851).

*Alcimus longurio*, Loew, Ofvers. Kongl. Vet.-Akad. Förhandl. xiv. 1857, p. 300 (1858), &c.

Walker's type is a female from S. Africa (*Dr. Smith*), and

other specimens are from S. Africa, Natal, and Zululand; males from Durban and Cape Colony in South African Coll. .

Length of type 23 mm. (other females attain to 33 mm.) ; males 30 mm.

An easily distinguished species, having wholly black legs, the tibiae only paler at the base. Moustache black and yellow.

*Trupanea longipes*, Macq., from an unknown locality, is very likely the same as this species; though placed under *Promachus* in Kertész's Cat., there is no doubt, from the figure of the wing given by Macquart, of its generic place.

*Alcimus longurio*, Loew, is no doubt the same as Walker's species.

This species, mentioned under the name of *Alcimus perlongus*, is stated to be "the most active and voracious enemy of the butterfly." In a paper published by C. N. Barker, F.E.S., "Some Records of Predaceous Insects and their Prey in the Durban Museum," in the 'Annals of the Durban Museum,' ii. pt. 2, p. 94 (1918), Mr. Barker says that, so far, he has come across no other species of this group which preys on butterflies.

*Alcimus tristrigatus*, ♂, Loew.

Dipt. Faun. Süd-Afrik. i. p. 134, pl. i. fig. 51 (1860); Ricardo, Ann. & Mag. Nat. Hist. (7) vi. p. 175 (1900); Speiser, Schwed. Zool. Exped. Ost-Afrik. p. 99 (1910).

Specimens from Voi and Makindu, Brit. E. Africa; from Pretoria (Distant Coll. and H. K. Munro); a male from Smithfield, Orange River (*Kannemayern*), in South African Museum Coll. Speiser has recorded it from Kilimandjaro.

This species is distinguished from *Alcimus rubiginosus*, Gerst., by its usually slightly smaller size, and the thorax is, as a rule, greenish brown, with darker stripes. The bristles on the sides of the abdomen are white, and those on the posterior part of the thorax, described by Loew as black, often appear to be white. Legs brownish or blackish, the underside of all femora and apices of tibiae reddish; bristles white.

Length 30-32 mm. (males), 32 mm. (females). Loew gives 34 mm.

The females from Brit. E. Africa have the ovipositor quite reddish, not blackish brown.



*Alcinus rubiginosus*, Gerst.

Archiv f. Naturgesch. xxxvii. 1, p. 362 (1871), et in Decken's Reise in Ost-Afrik. iii. 2, p. 387, pl. xvi. fig. 5 (1873); Ricardo, Ann. & Mag. Nat. Hist. (7) vi. p. 174 (1900).

Specimens from Uganda; Somaliland; Buluwayo (*G. W. Bury, E. C. Chubb*); Zomba, British Central Africa (*Rendall*); and a long series of males and females from 150–200 miles west of Kambove, 3500–4500 feet, 11. 10. 17 (*Neave Coll.*).

In I. E. E. Coll. specimens from German East Africa and Nyasaland.

A large species, distinguished from *Alcinus tristrigatus*, Loew, by the bristles on the legs being chiefly black and those on the posterior part of the thorax the same colour; the bristles on the sides of the abdomen are black and white. The thorax appears to be usually reddish brown in colour, with the stripes not very distinct.

Length from 30–32 mm. (males), 37–40 mm. (females).

*Alcinus brevipennis*, ♂ ♀, sp. n.

Type (male), type (female), from junction of Blaauw Krantz and Tugela River, Natal, Oct. 1896 (*G. A. K. Marshall*); and another female.

A very large species, the wings in proportion very short, the male with four stout black bristles on the scutellum; the females, however, with the usual two bristles. Legs reddish, the femora and apices of tibiæ blackish, bristles on legs chiefly white.

Length, ♂ 38, ♀ 40–45 mm.

*Male*.—*Face* reddish, with pale tomentum. *Moustache* pale yellow, and weaker hairs of the same colour continued to the antennæ. *Palpi* red, with yellow hairs. *Beard* white. *Antennæ* red, the third joint black, as long as the first two together, with a stout arista. *Forehead* same colour as face, the bristles yellow, as are those on vertex, bordered on each side with very stout black bristles. *Thorax* light brownish olive, with glistening white tomentum at sides and traces of it between the very narrow brown median stripes and the broader two blackish-brown spots representing the side-stripes; dorsum with very short black bristly hairs and some long white bristles on posterior border intermixed with shorter black ones. *Scutellum* same colour as thorax, with short black bristles and hairs. *Abdomen* with the usual large black spots and side-spots, and with stout white bristles

at the sides. *Genitalia* short, stout, red, with short white pubescence, the pubescence on dorsum of abdomen short, white. *Legs* reddish, the femora black above and the tibiae black at their apices, more widely so on the hind pair; the bristles all white, a few black ones on the tarsi; the pubescence white, on the underside of femora and tibiae longer. *Wings* about a third shorter than the abdomen, veins reddish.

*Female* identical; owing to the greater length of the abdomen, the wings are still shorter in comparison. *Ovipositor* long, shining red, with two spines at apex.

*Alcimus stenurus*, Loew.

Dipt. Süd-Afrik. i. p. 136 (1860), et Wien. Ent. Mon. vii. (1863).

Males and females from Deelfontein, S. Africa (*Col. Sloggett*), and a male from Pretoria.

The species was apparently described from one female specimen. It seems very nearly allied to *Alcimus tristrigatus*, and may prove to be only one species.

Loew describes it as "yellowish white pollinosa." The chief difference appears to be in the colour of the legs; in this species only the underside of the fore femora and base of tibiae are chamois-coloured or reddish, elsewhere the colour is blackish.

The spots on the abdomen are, perhaps, narrower.

Loew gives the length as  $32\frac{1}{2}$ –36 mm. In these specimens the males range from 28–37 mm., the females 36 mm.

*Alcimus porrectus*, Walker.

Dipt. Ins. Saund. i. p. 126 [*Trupanea*] (1851), et List Dipt. vii., Suppl. 3, p. 613 [*Trupanea*] (1855).

This is placed under *Promachus* in Kertész's Cat.

Type (male), ? S. Africa (Walker Coll.).

Type (female), S. Africa.

A male from Dunbrody, Cape Colony (*Rev. W. O'Neil*), in South African Coll.

A reddish species, apparently not described under any other name, with reddish legs, only the femora with a black stripe below; all bristles on the legs black. Abdomen with large broad black spots and with black bristles at the sides.

Length, ♂ 30, ♀ 34 mm.

*Male*.—*Face* covered with yellowish tomentum. *Moustache* rather scanty, yellow, with two or more large black bristles near the oral opening. *Thorax* (denuded) reddish, with the

stripes and with black bristles on the posterior part. *Scutellum* same colour, with two black bristles. *Abdomen* reddish, with grey borders round the black spots. *Genitalia* simple, reddish, with whitish pubescence. *Legs* with only black bristles. *Wings* clear, tinged yellow, and greyish at apex.

*Female* identical. *Scutellum* with three black bristles. Fore femora below with some short black bristles near the base, also present in the male, but not so stout; pubescence on legs short, white.

Both types are in bad condition.

*Alcimus cinerascens*, Ricardo.

Ann. & Mag. Nat. Hist. (7) vi. p. 176 (1900).

No new specimens have been added to the three males and four females from Nyasaland in the original description.

A species measuring 18–22 mm.

The fore legs with long white pubescence, red with some black colour chiefly on the fore legs.

A male from M'fongosi, Zululand (W. E. Jones), in South African Coll.

*Alcimus turniopus*, Rondani.

Ann. Mus. Civ. Genova, iv. p. 292 [*Promachus*] (1873).

Two males from Zigi Tsana, Abyssinia, v. & vi. 1902 (*Degen*); one female from Zomba, Nyasaland (*H. H. Johnston*); one female from Abyssinia, Nov. 1911 (*R. J. Stordy*). In I. E. E. Coll.

A species described by Rondani as nearly allied to *Alcimus stenurus*, Loew. Legs chiefly red, the femora with black stripes on outer and inner sides. The presence of black short bristles on the underside of the fore femora in the female is a characteristic of this species.

Length, ♂ 30, ♀ 35 mm.

Rondani described his type as from Abyssinia.

*Alcimus nigrescens*, ♂ ♀, sp. n.

Type (male), type (female), and others from Mt. Mlanje, Nyasaland, 1–10. i. 1913 (*S. A. Neave*), in I. E. E. Coll.

A blackish-coloured species with a black and yellow moustache and legs red and black, the femora chiefly black. Wings tinged yellowish brown.

Length, ♂ 24, ♀ 25–30 mm.

*Male*.—*Face* yellowish brown covered with yellow tomentum. *Moustache* composed of strong yellow and black bristles, the latter surrounding the oral opening; weaker yellow hairs are continued up the centre, and a row of black short bristles extends on each side to the antennæ, which are red on the first two joints, with strong black hairs, the third joint blackish. *Palpi* black, with pale hairs. *Beard* white. *Forehead* with some weak yellow hairs and a few black ones. *Hind part of head* with strong black bristles. *Thorax* yellowish brown, paler at the sides, with the usual stripes dark and distinct; pubescence on dorsum chiefly short, black, all bristles black. *Scutellum* with two black bristles and chiefly black hairs. *Abdomen* with the usual spots large, black, the side ones also blackish; bristles at sides black; pubescence black and white on dorsum, very short. *Genitalia* short, stout, black, with white hairs. *Legs* with chiefly black bristles, the femora almost entirely black except at the extreme base and at apices; tibiæ red on their basal half and black beyond; tarsi reddish, black at the joints, pubescence white and thick, though short; the fore femora below with weak bristly black and yellow hairs; fore tibiæ with at least two long black bristles on the outer side and some long weak bristly yellow hairs; the fore tarsi with occasional white bristles below. *Wings* not so long as the abdomen.

*Female* identical; the two long bristles on the fore tibiæ are usually yellow, and those on the outside of the tarsi also yellow.

*Anacinaces gigas*, ♀, Enderlein.

Zool. Anz. xlv. 6, p. 257 (1914).

One female (incomplete) from Chauntabun, Siam (*Mouhot*).

Though this specimen is very much mutilated, it appears to be a specimen of the above species recorded from Sumatra (one female). The genus was founded by the author for this species, taking the place of the genus *Erax* in this region, distinguished from it by the very short ovipositor in the female.

It is a large insect, the abdomen covered with golden-yellow short pubescence. Legs entirely black.

Length 28 mm.

*Proctacanthus penultimus*, Walker.

Dipt. Saund. i. p. 134 (1861), et List Dipt. vii., Suppl. 3, p. 726 (1855) [*Asilus*].

Type (male) from E. India (Walker Coll.).

A very large reddish-brown species with red legs.

Length 32 mm.

*Face* with greyish-yellow tomentum ; tubercle large, taking up two-thirds of the face. *Moustache* yellowish. *Falpi* yellow-haired. *Antennæ* reddish yellow, the third darker, short, with a long arista. *Forehead* with yellow hairs on each side. *Thorax* reddish brown, stripes are not discernible ; pubescence short, black. *Scutellum* the same colour, covered with long black bristly hairs. *Abdomen* with short black and yellow pubescence, same colour as thorax, the seventh segment covered with dense dirty white pubescence, appearing as a band, the last segment covered with it in less degree ; the hairs at sides are black on the first two segments, some yellow hairs intermixed ; on the other segments the hairs are yellow. *Genitalia* shining red, simple, but large, with yellow hairs. *Legs* stout, the fore and middle femora with an assemblage of short stout black bristles on their undersides at base ; they are present in a single row only on the posterior pair ; pubescence chiefly yellow and short. *Wings* very large, tinged yellow.

*Asilus opulentus*, Walker.

Ins. Saund., Dipt. p. 150 (1851), et List Dipt. vii., Suppl. 3, p. 724 (1855).

Type (male) from India (Walker Coll.).

A large species, with the black abdomen covered with bright orange-yellow hairs. *Legs* yellow, femora black. *Antennæ* black.

Length 20 mm.

*Face* covered with grey tomentum, the tubercle large. *Moustache* composed of black bristles above and yellow ones below. *Beard* yellow. *Antennæ* black, the first two joints with black bristly hairs, the third joint longer than the first two together, its arista about two-thirds its length. *Forehead* with black bristly hairs on each side. *Hind part of head* with black bristles and yellowish soft hairs round head. *Thorax* blackish, with short black pubescence and grey tomentum, longer black hairs on the posterior half. *Scutellum* greenish grey, with long tawny hairs, the posterior border armed with a fringe of stout black bristles. *Abdomen* black, the golden hairs thick on each segment, long and dusky. *Genitalia* short, stout, simple, the upper forceps black, stout, the lower pair shorter, ending in a point, the pubescence on both chiefly pale yellow ; a fringe of black hairs on the posterior border of the underside of the last

segment. *Legs* reddish; femora black, with soft yellow hairs below and yellow pubescence above; fore tibiae with long soft black hairs below and short bristly black hairs on the upper sides and three long black bristles on outer sides; pubescence elsewhere yellow; the other tibiae have only a few of the long black hairs; tarsi heavily armed with black bristles and with black pubescence. *Wings* tinged grey, clear in the centre.

*Asilus armatipes*, Macq.

Dipt. Exot. Suppl. 5, p. 83, pl. ii. fig. 8 (1855).

*Asilus shalumus*, Walker, Trans. Ent. Soc. Lond. n. ser. iv. p. 131 (1857).

One male from Golden Buddha Mts., N. of Chunking, Sze-chien Province, 5000 feet (*W. A. Maw*, 1907).

Female type of *A. shalumus* from China (Walker Coll.).

• Macquart described his type from N. China.

The species is distinguished by the curious assemblage of short, stout, black bristles on the underside of the middle femora and tibiae in both sexes; it is a large black fly, Macquart giving 16 mm. for the male and 18 mm. for the female; these measure respectively 22 mm. and 27 mm. Otherwise they agree with his description, though his figure of the genitalia does not altogether agree with those of this male.

*Male*.—*Face* covered with golden tomentum, tubercle confined to the lower part of the face. *Moustache* golden yellow, with a few black hairs. *Antennae* reddish. *Palpi* golden-haired. *Thorax* blackish, with grey tomentum and black pubescence. *Scutellum* denuded, with probably two black bristles. *Abdomen* black, with black bristles, the last segment with deep golden-yellow pubescence; the ground-colour of the segment itself appears the same colour, the anterior segment shows traces of white tomentum. None of this colouring appears in the female. *Genitalia* transparent yellow, the upper forceps large, bifid, the upper tooth short, stout, the lower one long, stout, its broad apex concave, with a short tooth on the outside; pubescence yellow, the lower pair of forceps very small, hardly visible. *Legs* reddish yellow, the fore femora with long yellow and black hairs below, the middle ones with a double row of stout short black bristles on the middle of the underside, the middle tibiae with a row of similar ones, interlocking when the legs are bent up; the hind legs entirely bare, the tibiae with two or three black bristles. *Wings* large, tinged yellow.

*Female* identical, but the *abdomen* is entirely black, *ovipositor* short. The black bristles on the middle femora are more numerous and nearer the base.

Verrall, in 'British Flies,' vol. v. p. 653 (1909), suggests this little-known species should form a new genus intermediate between *Pamponerus* and *Polyphonus*.

*Asilus orientalis*, ♂ ♀, sp. n.

pe (male) and type (female) from Khasi Hills, Assam (purchased E. Heyne), and other males and females from the same locality.

A large species rather resembling *Asilus opulentus*, Walk., but the legs are wholly black. Moustache black and yellow. Antennæ brownish, the third joint long.

Length, ♂ 15-17, ♀ 31 mm.

*Male*.—*Face* black, covered with golden tomentum, the tubercle large, extending over most of the face. *Moustache* composed of golden-yellow fine hairs, with one or more black ones above. *Palpi* yellow-haired. Beard golden-yellow. *Antennæ* blackish, the first joint at its base and the second joint reddish brown, the third joint longer than the first two joints together, cylindrical; the arista stout, about two-thirds of the length of the joint itself, the first two joints have black hairs. *Forehead* with black hairs. *Thorax* denuded, blackish brown, with four narrow yellow tomentose stripes; pubescence short, black, with many longer hairs and bristles posteriorly. *Scutellum* same colour as thorax, with black hairs, the posterior border armed with a fringe of long black bristles. *Abdomen* black, the golden hairs bushy and thick on the first four segments, more particularly so on the sides and on the posterior borders, the remaining segment with much fewer hairs; underside with soft yellow hairs. *Genitalia* black, the upper forceps stout, club-shaped, the lower ones shorter, stout, both with soft black hairs, and some yellow ones on the upper pair at apices; below, a tuft of thick golden-yellow hairs appears, proceeding from the centre of the last segment on its underside. *Legs* black, with reddish appressed pubescence on the hind tibiæ and metatarsi; the pubescence otherwise is black, yellow on the underside of the fore and middle femora, with some long black hairs at the base of fore femora; middle coxæ with some short, strong, black bristles; the middle and hind tibiæ with black bristles below; all bristles on the legs black. *Wings* tinged brown, the posterior branch of the third vein with a

concave curve, the small transverse vein before the middle of the discal cell.

*Female* identical; the golden or reddish-yellow pubescence on *abdomen* extends on the first three segments, on all the others it is thick but short. *Ovipositor* black, short, appearing almost compressed.

None of the specimens are in very good condition.

*Asilus montanus*, ♂ ♀, sp. n.

Type (male) from Khasi Hills, Assam (purchased E. Heyne); type (female) from Masuri, N.W. Himalayas, 5000 feet (*Major H. D. Peile*); another male and female from Darjeeling, (Bingham Coll.); other females from Khasi Hills (*F. W. T. Sladen*).

In the Forest Research Coll. are four males from Sattal, Bhowali, Dharniste, and Shann Ket in Kumaon.

A large species. Antennæ yellow and brown, the third joint with a long arista. Abdomen greyish brown, with white segmentations. Legs yellow. Genitalia large, bifid.

Length, ♂ 26, ♀ 25–26 mm.

*Male*.—*Face* with greyish tomentum, the tubercle small, on lower part of face. *Moustache* of white bristly hairs, the rest of the face bare. *Palpi* with long black bristly hairs. *Antennæ* reddish yellow in type; arista black, as long as the first joint. *Forehead* with yellow hairs. *Thorax* (denuded) blackish brown, with black hairs and greyish tomentum. *Scutellum* with two black or yellow bristles. *Abdomen* (denuded) blackish brown, with yellowish tomentum and yellow hairs, which latter are also present on the sides with some yellow bristles. *Genitalia* large, the upper forceps black, wide, bifid, the two teeth widely separated, under pair very small; underside of last segment fringed with yellow hairs; pubescence elsewhere black. *Legs* reddish yellow, knees slightly darker; pubescence scanty, yellow, with long fine hairs and bristles below; tarsi with black bristles. *Wings* clear, with shaded apices and posterior border; the posterior branch of the third vein slightly concave, the small transverse vein beyond the middle of the discal cell; veins black.

*Female* identical. *Palpi* white-haired, with some black long bristles. *Antennæ* with the third joint brown. *Thorax* blackish brown, with grey tomentose stripes visible. *Scutellum* with two yellow bristles. *Abdomen* with paler segmentations and pale hairs on them; some white bristles at sides only. *Ovipositor* small, shining black; underside of



abdomen with white hairs; on the dorsum yellowish or greyish tomentum is present. *Wings* with yellow veins.

*Asilus depulsus*, ♂, Walker.

Proc. Linn. Soc. London, vii. p. 207 (1864).

Type (male) from Menado.

A pale-coloured species, with reddish-yellow legs; the abdomen covered with yellowish tomentum. Antennæ black. Moustache whitish.

Length 14 mm.

*Face* covered with yellow glistening tomentum, tubercle only on the lower part of face. *Moustache* composed of stout black and yellow bristles. *Palpi* with yellow hairs. Beard whitish. Face above moustache bare. *Antennæ* blackish, the second joint reddish, with yellow hairs, the first with short, stout, black bristles, the third longer than the two joints together; arista as long as or longer than the joint. *Forehead* with tomentum as on the face and with yellow hairs on each side. Hind part of head with black bristles and some yellow ones. *Thorax* blackish brown, with greyish-yellow tomentum, the median broad stripe very narrowly divided, joining again posteriorly, the side-stripes distinct; pubescence short, black, with longer black bristles posteriorly. *Scutellum* with two yellow bristles. *Abdomen* covered with yellowish tomentum and short yellowish pubescence, yellow bristles at sides. *Genitalia* very large, shining reddish brown; the upper forceps very large, trifid; the upper tooth short, reddish, with yellow hairs, the lower tooth large, solid, forming the oblong apex; between the two is a small reddish spine-like tooth, the lower forceps long, the basal part large, triangular, the apical part consisting of a stout point bent inwards; no pubescence is visible except some long yellow hairs on the upper side at the base, but the insect is in bad condition. *Legs* reddish yellow; femora with a short black stripe, faint on the hind pair; the knee and tarsi, with the exception of the metatarsi, also black; the fore femora with fine long yellow hairs below, the others with only a few, and stout black bristles; fore tibiæ with a few hairs below; elsewhere the pubescence is yellow, dark on the tarsi; all bristles black. *Wings* large, clear, with the usual shading at apices and posterior borders.

*Asilus contortus*, ♀, Walker.

Proc. Linn. Soc. London, i. p. 117 (1857).

Type (female) from Borneo (Walker Coll.).

A species with yellowish pubescence on the abdomen. Legs reddish yellow. Moustache black and yellow.

Length 19 mm.

*Face* covered with glistening yellow tomentum; the tubercle large, covered by the black and yellow bristles of the moustache. *Palpi* black-haired. *Antennæ* reddish brown, the third joint darker, the first two joints with black hairs, the third short, barely as long as the first joint; the arista nearly twice as long as the joint itself. *Thorax* blackish brown, with dark stripes and greyish-yellow tomentum; pubescence black. *Scutellum* denuded, yellow soft hairs are present. *Abdomen* brownish, with fulvous tomentum and yellow hairs on the segmentations which are pale in colour; the yellow hairs are thick at the sides, the last segment almost bare, with a little black pubescence; the ovipositor short; underside with some soft yellow hairs. *Legs* with traces of a black stripe on the femora; tarsi black. *Wings* tinged yellow, the posterior branch of the third vein bent inwards a little; the other branch has a very short appendix at its base.

*Asilus superveniens*, ♀, Walker.

Proc. Linn. Soc. London, iii. p. 128 (1859).

Type (female) from Key Island.

A medium-sized greyish-black species. *Antennæ* blackish. Moustache black and yellow. Legs red; femora with black stripe.

Length 20 mm.

*Face* with golden tomentum, the tubercle on the lower part of the face. *Palpi* black-haired. *Antennæ* with the first two joints black, with black bristly hairs, third joint wanting. *Forehead* with black bristly hairs. *Thorax* blackish, with grey tomentum and black pubescence; stripes are apparent and black bristles are present posteriorly. *Scutellum* with black hairs and two stout black bristles. *Abdomen* brownish, covered with yellow tomentum and black pubescence; ovipositor very short, yellow bristles at sides of abdomen. *Legs* reddish yellow; femora with black stripes not quite reaching the apex; the tarsi, excepting the metatarsi, all black, bristles all black. *Wings* clear, grey at apices and on fore borders.

A female from the New Hebrides is very near this male.

*Asilus determinatus*, ♂, Walker.

Proc. Linn. Soc. London, iv. p. 107 (1860), et v. p. 265 (1861); Ricardo, Ann. & Mag. Nat. Hist. (8) vi. p. 449 (1913).

Type (male) from Makessar.

The female type described by Walker is not to be found; from the description of the abdomen it may belong to *Neositatus*, in the group of *philus*, Wlk.

This male has half the abdomen broken off; Walker gives its length as 20–24 mm.

*Antennæ* black. *Moustache* black and yellow. *Palpi* yellow-haired. *Thorax* blackish, with well-marked stripes. *Scutellum* with four or more black bristles and white hairs. *Abdomen* blackish, the first two segments with yellow tuft-like hairs. *Legs* reddish yellow; femora black above; tibiae with black apices; tarsi black; pubescence on legs golden-yellow, black on the dark parts; the fore and middle tarsi stout, armed heavily with short black bristles. *Wings* large, tinged yellow.

*Asilus introducens*, ♀, Walker.

Proc. Linn. Soc. London, iv. p. 108 (1860), et vii. p. 232 (1864); Ricardo, Ann. & Mag. Nat. Hist. (8) xi. p. 449 (1913).

Type (female) from Makessar.

? Type (male) from Waigiou.

The female has tuft-like greyish-white hairs on the first two segments of abdomen; the male has, in addition, on the fifth and sixth segments grey-white tomentose bands with white pubescence, and is probably a different species. Walker places it with the female with a query.

*Female* has black *antennæ*. *Moustache* yellowish white. *Abdomen* has the *ovipositor* broken off; Walker describes it thus:—" *Abdomen* has nearly half the apical point stylate." *Scutellum* with three weak black bristles. *Legs* stout, reddish; femora blackish at base and at apices; tibiae with black apices, and tarsi black.

*Male* has more slender legs, the tarsi not so dark. *Genitalia* (imperfect) large, black, shining, with white hairs above and below. *Scutellum* with two black bristles.

Walker gives the length as 16–24 mm.

*Asilus maculipes*, ♀, Walker.

List Dipt. vii., Suppl. 3, p. 605 [*Trupanea*] (1855).

Type (female) from Hong Kong, abdomen broken off. Walker described it as 20 mm. long, and the abdomen

thus:—"Abdomen deep black, about twice the length of the thorax, with pale gilded tomentum on each side of the broad part, which is about twice the length of the apical style."

*Moustache* yellow. *Antennae* black. *Scutellum* covered with long yellow hairs. *Legs* very similar to those of *Neoitamus philus*, Wlk., the fore tarsi stout and heavily armed with black bristles. Wings large, tinged yellowish.

From the description of the female abdomen in this and in *determinatus* and *introducens* they might possibly all belong to the *Neoitamus* genus, in the group of *N. philus*, Wlk.

In fact, *Asilus maculipes* itself may be a specimen of *Neoitamus philus*, or, at any rate, a species very nearly allied to it; but till further material is available, the matter must be left in abeyance. Walker placed it in the genus *Promachus*.

*Asilus pulcher*, ♂, sp. n.

Type (male) from Jhajra, Dehra Dun, 6. 12. 1912, in Forest Research Zool. Coll.

Another imperfect specimen from Hadagalli, Ceylon "in a jola-field," in Brit. Mus. Coll.

A handsome species, nearly related to the European and North-African species *Asilus barbarus*, L., but distinguished from it by all the femora being red, the fore femora with only weak bristly hairs, no strong black bristles, and the *genitalia* are bright red, not dark-coloured, and somewhat shorter.

The abdomen is entirely black. Thorax ochraceous tawny. Legs red. Wings yellowish, brown at apex and on posterior border.

Length 21 mm.

Face reddish, covered with yellowish tomentum, the lower part of the face is raised. *Moustache* of white bristles, consisting of a perfect row of bristles above oral opening and a few bristles above. *Palpi* reddish, with yellow hairs. Beard white. *Antennae* red, with some white tomentum and yellow hairs, third joint wanting. *Forehead* same as face, with yellow hairs. *Thorax* with yellow pubescence and indistinct dark brown median stripe, divided in middle anteriorly, yellow bristles on posterior half. *Scutellum* same colour as thorax, with yellow hairs and two yellow bristles on border. *Abdomen* velvety black, with white tomentose spots on the second, third, and fourth segments at sides; the three last segments covered with grey pubescence, absent, however, on the median line of dorsum; pubescence of abdomen chiefly black on the first four segments, on the last

three chiefly yellow ; underside as above. *Genitalia* bright chestnut-colour, small, short, the upper forceps with truncated ends, the lower side with a short apex, the under forceps large and stout, more than half as long as the upper pair, both with yellow pubescence. *Legs* reddish yellow, with yellow pubescence and yellow bristles. *Wings* large, tinged yellow, the veins yellow ; the grey shading of apex reaches nearly to the base of the cubital fork ; small transverse vein just beyond the discal cell.

In the specimen from Hadagalli the antennæ are perfect, the third joint as long as the first two joints, the arista rather short.

*Asilus paterculus*, Walker, did not belong to this genus, was in a fearfully dirty condition, and fell to pieces, so that it should be deleted from the list altogether.

*Asilus prafiniens*, Walker, from E. India, is not to be found, and should be deleted from the list, as also *Asilus latifascia* from Singapore.

The following species described under *Asilus*, in sensu lato, are unknown to me :—

*Asilus atripes*, F., from India. Schiner could not identify this species.

*Asilus pusio*, Wied, from India and Java.

*Asilus lactus*, Wied, from E. India.

*Asilus bifasciatus*, Oliv., from India. The colouring of the wings is described as white in the middle, dark elsewhere.

*Asilus hircus*, F., from Sumatra.

*Asilus ephippium*, *nudipes*, *nigrimystaceus*, and *trifarius*, Macq., all from India. The first-named is recorded from Persia by Becker.

*Asilus appendiculatus*, *clavipes*, *rufibarbis*, Macq., and *barbatus*, Dol., all from Java.

*Asilus minusculus*, Rondani, from Borneo.

*Asilus limbipennis*, *maculifemora*, and *misao*, Macq., all from N. China.

*Asilus condecorus*, Wlk., from Gilolo and Ternate. Type is lost.

The following species of *Asilus* in sensu lato from S. Africa are not known to me :—

*Asilus gabonicus*, *albitarsata*, and *scutellatus*, Macq., from W. Africa.

*Asilus forficula*, *nigribarbis*, and *natalensis*, Macq., from S. Africa.

*Asilus dioctræformis*, Macq., from Mauritius.

*Asilus alaster* and *schedius*, Walker, from S. Africa, and *Asilus enitens*, Wlk., from Arabia, should be deleted from the list, as the types cannot be found.

*Asilus* in the narrowest sense is not represented in any of the collections I have had access to from this region.

### PAMPONERUS, Loew.

Linn. Ent. iv. p. 135 (1849).

A genus distinguished by the milky-white base of wings in the male and by the strong spines on the sixth abdominal segment at sides. The females are not so easy to distinguish from species of *Asilus*.

With the exception of the well-known European *Pamponerus germanicus*, the genus so far appears confined to the Celebes and neighbouring islands.

*Pamponerus nigritulus*, v. d. Wulp, from the Moluccas, is unrepresented in the collections I have had access to.

#### *Pamponerus mendax*, ♂, Walker.

Trans. Ent. Soc. London, n. ser. iv. p. 130 [*Asilus*] (1857), et Proc. Linn. Soc. London, v. p. 260 [*Asilus*] (1861); v. d. Wulp, Tijd. v. Ent. xli. p. 135, pl. iv. figs. 9-10 (1898), et xlii. p. 55 (1899); Ricardo, Ann. & Mag. Nat. Hist. (8) xi. p. 461 (1915).

*Pamponerus areolatus*, Wlk. Proc. Linn. Soc. London, v. p. 260 [*Asilus*] (1861).

Type (female) of *areolatus*, type (male) of *mendax*, both from Menado, Celebes (Walker Coll.).

A species with wholly dark legs and abdomen, and with the wings in the male milky white at the base; in the female, as v. d. Wulp points out, the wing is brownish and only a little clearer at the base; the long thick pubescence on the femora and tibiae in the male are only represented in the female by a few black long bristly hairs.

Length, ♂ 13, ♀ 16 mm.

#### *Pamponerus areolaris*, Walker.

Proc. Linn. Soc. London, v. p. 260 (1861); Ricardo, Ann. & Mag. Nat. Hist. (8) xi. p. 460 (1915).

Type (male), type (female), and two females from Makassar, Celebes.

A species with reddish legs, the middle and posterior tarsi black. The wings as in *Pamponerus mendax*, but paler in colouring, in the female tinged brownish yellow and only clear in patches in the posterior cells and extreme base of posterior border. Abdomen covered with brownish-yellow tomentum and with dark median large spots; the segmentations lighter; pubescence short, black. Genitalia black, shining, with black hairs, large and complicated, in appearance rather like the abdomen of an *Asilus* species, but the strong pair of spines on the sides of the sixth segment distinguish the male; they are not present in the female, which has a short black ovipositor and the last segments covered with tawny short pubescence. Face golden-yellow as in *Pamponerus mendax*, but the moustache is yellow, with some black hairs above. The antennæ reddish yellow, the third joint darker, with a long arista, and shorter than the first joint.

Length, ♂ 23, ♀ 21-22 mm.

*Pamponerus albigerus*, ♂, sp. n.

Type (male) from Sula Islands was marked type with MS. name of *albigerus*, which is now adopted for this species, which is very similar to *Pamponerus areolaris*, but the moustache is wholly black and the fore tarsi are also black. Genitalia larger, with the upper forceps club-like at the end, whereas in the above-mentioned species it ends in a fine point, and in this species the black hairs are less numerous and much shorter.

Length 25 mm.

#### TRICHONOTUS, Loew.

Öfv. Kongl. Vet.-Akad. Förhandl. xiv. 1857, pp. 302 & 305 (1858).

*Trichonotus pegasus*, Loew.

L. c. et Dipt. Sudafrik. i. p. 165 (1800).

One male from Narok, Masai Reserve, Brit. E. Africa (Luckman).

Loew described his specimen from Kaffraria, and gave the length as 15 mm.; this male is slightly longer.

A species easily distinguished by its general likeness to the specimens of *Dysmachus*, but the wing in the male is much dilated. Moustache as in *Dysmachus*, white, bordered with black hairs. Scutellum with thick white hairs and no

bristles. *Legs* black; apparently the yellow colour is more predominant than in Loew's specimen, as all the tibiae and the tarsi are yellowish.

*Dysmachus robustus*, ♂ ♀, sp. n.

Type (male), type (female), and other males and females, all from Pretoria (*Miss J. Brincker*).

In Loew's Division A. II.<sup>1</sup>.

It differs from *Dysmachus erythracanthus*, Hermann [*Lophonotus*], from the Cape, by the absence of any bristles on the underside of the abdomen, and from *Dysmachus chuloo-gaster*, Wied, by the presence of bristles on the dorsum of abdomen. Hermann places his species under Division A. II.<sup>2a</sup>.

A large robust species, measuring, ♂ 25–28, ♀ 23–29 mm.

*Male*.—*Face* covered with yellowish-white glistening tomentum; tubercle on lower part of face. *Moustache* as in *Dysmachus*, thick, reaching the antennae, composed of long yellowish-white hairs, also extending round the oral opening. *Beard* whiter. *Palpi* yellowish, white-haired. *Antennae* black, the first two joints with numerous long black bristles on lower sides, one or two white ones intermixed; third joint linear more or less, the arista about the same length, the joint not much longer than the first joint. *Forehead* same colour as face, with long black hairs. *Hind part of head* with white bristles curved over. *Thorax* blackish, with grey tomentum; a median undivided black stripe, very distinct, bordered on each side by an olive-green stripe. *Mane* black, short on the anterior half, longer behind, with many long whitish bristles bordering it; all bristles white; the pubescence on dorsum short, black, white hairs posteriorly on sides. *Scutellum* covered with long, whitish, bristly hairs, a few short black hairs intermixed, but no strong bristles on border, only the white bristly hairs forming a continuous fringe. *Abdomen* blackish, covered with white tomentum on sides and on dorsum, with the large brownish tomentose spots, on which a distinct, narrow, median, black stripe is visible; pubescence chiefly yellowish, short, some yellow bristles at sides; underneath some weak yellow hairs. *Genitalia* very large, black; upper forceps massive, two-pronged, the upper one with some black short hairs, the lower one with white hairs rather spine-like, both widely separated, the lower one short and small, palpus-like, with white hairs, the plate above them black, with white hairs on border. *Legs* wholly black, with the exception of the fore and middle tibiae, which are obscurely red at extreme base; pubescence



white and fairly thick on legs, the bristles all yellowish; a few black ones on fore femora, which have white hairs below. *Wings* clear, veins yellowish red, the small transverse vein beyond the middle of the discal cell.

*Female* identical, the red on the tibiae very slight or non-existent. *Ovipositor* black, with white hairs and yellowish ones at apices, not much longer than the last segment.

### ? *New Genus near Dymachus.*

A male specimen from Gundumri, Bhandaro, C.P., India, sent me some years ago by A. D. Imms, has a striking resemblance to a species of *Dymachus*, a genus as yet with no representative in the Oriental Region. This specimen will probably require a new genus, as it has no tubercle on the face and no widening of the base of the second posterior cell. Being in a bad condition, with no antennae or legs, it is useless to describe it further; but it is placed in the Brit. Mus. Coll. in the hope that other specimens may be forwarded in the future.

### SYNOLCUS, Loew.

Öfvers. Kongl. Vet.-Akad. Förhand. xiv. 1857, pp. 361, 362 (1858).

This genus is distinguished by the dilated wings in the male and by the bulging of the discal cell into the first posterior cell.

It is confined as yet to the South African and Oriental Regions, three species being known from the former and five from the latter.

### *Table for Species of Synolcus from the South African Region.*

1. Legs chiefly yellow .....	2.
Legs chiefly black .....	3.
2. Yellowish species. Femora with a short black stripe .....	<i>dubius</i> , Macq.
Black and brownish-grey species. Femora with a long black stripe .....	<i>tenuiventris</i> , Loew.
3. Wings with a dark spot at apex. Dark-coloured smaller species .....	<i>acrobaptus</i> , Wied.

### *Synolcus dubius*, Macq.

Dipt. Exot., Suppl. i. p. 217, pl. viii. fig. 15 [*Asilus*]; Loew, Dipt. Süd-Afrik. i. p. 149 (1860).

Two females from Umbilo, Natal (*E. C. Chubb*) (1913); one female from Karkloof, Natal (*G. A. K. Marshall*) (1897). In Durban Coll. are two females from Umbilo,

Natal (*Bevis*), and two others from same locality, and one male from Upper Tongaat, Natal (*Barker*).

A species chiefly yellow in colour, legs with a short black stripe on the femora, tarsi with the exception of the metatarsi black. *Antennae* yellow, the third joint blackish. *Moustache* yellow. *Thorax* with a broad black median stripe and side ones. *Abdomen* with black median spots. *Wings* clear.

Length of these females 19–22 mm.

*Synolcus tenuiventris*, Loew.

Dipt. Süd-Afrik. i. p. 147 (1860).

A male from Karkloof, Natal (*G. A. K. Marshall*) (1897); another from Upper Tongaat, Natal (*C. N. Barker*) (1919); and another from Port Natal.

Two males from Lucia Bay (*Bell Marley*), in Durban Museum Coll.

A darker-coloured species than *Synolcus dubius*. *Abdomen* ashy-grey with dark spots. *Wings* much dilated.

Length 18–25 mm.

Loew has described this and the following species, *Synolcus acrobaptus*, very fully.

*Synolcus acrobaptus*, Wied.

Ausszweifl. Ins. i. p. 449 [*Asilus*] (1828); Schiner, Verh. zool.-bot.

Ges. Wien, xvi. p. 685 (1866); et xvii. p. 404 (1867).

*Synolcus signatus*, Loew, Dipt. Süd-Afrik. i. p. 148, pl. ii. figs. 1, 2 (1860).

One male from Cape Town (*Péringuey*), in the South African Museum Coll.

A smaller species than *Synolcus tenuiventris*, and at once distinguished by the dark spot at apex of wing. A dark-coloured species with wings much dilated in the male, the tibiae dull testaceous on the anterior and middle pair.

Length, ♂, 14 mm.

*Asilus incisuralis*, Macq., from the Cape, is described by him as having the wings dilated in the male and legs chiefly black; but the wings are declared to be a little brownish, clear at base and in centre. Is it possible that this is a species of *Synolcus*?

#### *Table for Species of Synolcus from the Oriental Region.*

- |   |    |
|---|----|
| 1. Wings very suddenly dilated in males . . . . | 2. |
| Wings only slightly dilated in males, in one    |    |
| species not at all . . . . .                    | 3. |

2. Reddish-yellow species. Legs almost wholly yellow ..... *xanthopus*, v. d. Wulp.  
 Brownish species. Legs with the femora black at apices ..... *annulatus*, F. ✓  
 Brownish species. Legs with a long black stripe on the femora ..... *iamenus*, Wlk. ✓  
 3. Small pale species. Legs with a black stripe on anterior and middle femora .... *duvaucelii*, Macq. ✓  
 Brownish species. Legs with a short black stripe on the femora ..... *bengalensis*, Macq. ✓

*Synolcus xanthopus*, Wied.

Zool. Mag. i. p. 3 (1819); Dipt. Exot. p. 186 [*Asilus*] (1821); et Auszweifel. Ins. i. p. 436 [*Asilus*] (1828), etc.  
 ? *Asilus sundanicus*, Jaenn. Abhandl. Senckenberg. Naturforsch. Ges. vi. p. 363 (1867).

Two males from Java (Walker Coll.).

One male from Chantabun, Siam (*Mouhot*); and a series of males and females from different localities in Siam (*Robinson and Annandale*), 1901.

Male and female from Port Dixon, Malay Peninsula (*G. Meade Waldo*), 1908.

Male from Kuala Lumpur, Selangor (*Dr. H. E. Durham*), 1902.

Male from Sungei Penok, Korinchi Valley.

Two females from Pasir Ganting and Korinchi, Sumatra.

A bright yellowish species with wholly yellow legs, only the apices of the hind femora dark. *Abdomen* with dark spots either in three rows or merged into one large one, in some specimens the abdomen is altogether darker, as observed by v. d. Wulp (Tijd. v. Ent. xli. p. 142, 1898) in two males from Java, the thorax being also darker.

*Genitalia* appear similar to those of *S. annulatus*, but the tuft of hairs below is not so noticeable.

*Wings* much dilated in males.

Length, ♂ ♀, 19–25 mm.

*Synolcus annulatus*, Fabr.

Syst. Ent. 794 [*Asilus*] (1775), etc.

*Asilus flavicornis*, Macq. Dipt. Exot. i. (2) p. 258 (1838).

*Asilus barium*, Wlk. List Dipt. ii. p. 423 (1849).

Type of *Asilus barium*, a male from Ceylon (*Wenham*).

Three females from Dehra Dun, India Forest Research Zool. Coll., and a series of males and females from different parts of Ceylon (*Yerbury, Green*), in Brit. Mus. Coll.

In I. E. E. Coll. a male from Cooro Sidapur, Rockhill (T. V. R. Coll.), and a female from Coorg Sanivarsandi, Hansey Estate (T. V. R. Coll.), S. India.

A species distinguished by the darker colour of thorax and abdomen from *Synolcus xanthopus*, v. d. Wulp. *Antennae* usually yellow. *Legs* yellow with usually black apices on all the femora; this will serve to distinguish the species from the dark varieties of v. d. Wulp's species mentioned by him. *Wings* much dilated in males. *Genitalia* long, the upper forceps simple, the under pair smaller, a long tuft of brownish or yellowish hairs situated between and above them; pubescence yellow and black.

The male from Rockhill has the legs almost entirely yellow, only the extreme apices of the middle and posterior femora are black.

Length, ♂ 18–21, ♀ 20–23 mm. The Walker type measures 21 mm.

*Synolcus iamenus*, Walker.

List Dipt. ii. p. 428 (1849), et vii., Suppl. 3, p. 728 (1855).

Type (male) from India and another (*Mrs. Hamilton*). Males and females from Dehra Dun in Forest Research Zool. Coll.

A male from Guindy, Madras, and a female from Kotagiri, S. India, 6000 ft., both in Cragg Coll.

Two males from Cooro Mercara, 4500 ft. (T. V. R. Coll.), in I. E. E. Coll.

A species distinguished by black stripes on all the femora, otherwise the *legs* are yellow. General colouring the same as in *Synolcus annulatus*, F. *Abdomen* with large brown spots and grey segmentations. *Genitalia* with long white hairs above and below, and some black hairs intermixed. *Wings* in male much dilated.

Length, ♂ 15–25, ♀ 21 mm.

The series of specimens from Dehra Dun were caught "on grass."

Abdomen in well-preserved specimens has three lines of dark oblong spots forming stripes, but not united, lying on obscure large spots.

*Synolcus duvaucelii*, Macq.

Dipt. Exot. i. (2) p. 257, pl. xii. fig. 1 (1838) [*Asilus*].

Two males from India.

A smaller paler species than *Synolcus iamenus*, Wlk., distinguished by the much slighter dilation of wing in the male. *Abdomen* ashy-grey with three series of small dark spots. *Legs* as described by Macquart, with the exception of the anterior and middle femora, which have the black

stripe running almost the whole length of femur, not only black at the apex. *Genitalia* with large black upper forceps, covered with long white hairs above and below, the under forceps small, the yellow organs long. The figure by Macquart appears to be that of a female, and the bend of discal cell into the first posterior cell is not shown in the figure of the wings, which are only slightly dilated in these specimens and are quite clear.

Length 18 mm., Macquart gives 16 mm.

In spite of the figure of wing, I believe this species belongs to this genus.

*Synolcus bengalensis*, Macq.

Dipt. Exot. i. (2) p. 257, pl. xii. fig. 2 [*Asilus*] (1838); v. d. Wulp, Tijds. v. Ent. xli. p. 142 (1898), et xlii. p. 55 (1899).

One female from Coimbatore (T. V. R. Coll.), S. India, in I. E. E. Coll.

One specimen from Bangalore, same collection.

These appear to belong to the above species, which is distinguished from *Synolcus iamenus*, Wlk., by the *short* black stripe on the femora confined to the apical third, and according to v. d. Wulp by the non-dilatation of the wings in male.

Length circa 22 mm. of above female.

V. d. Wulp removed it to this genus.

*Heligmoneura congedus*, ♂ ♀, Walker.

Ins. Saund., Dipt. p. 138 (1851); et List Dipt. vii., Suppl. 3, p. 726 (1855).

Type (male), type (female), from India (Walker Coll.).

Both these specimens are in bad condition; they appear to be species of this genus, the *wings* are quite clear. *Antennæ* black. *Moustache* white. *Legs* yellow with the apices of the femora and tarsi dark.

Length 14 mm., but the abdomen is imperfect.

*Heligmoneura gnava*, ♀, v. d. Wulp.

Tijds. v. Ent. (2) vii. (xv.) p. 242 [*Mochtherus*] (1872); Ricardo, Ann. & Mag. Nat. Hist. (9) iii. p. 73 (1919).

A male from Takala, Kumaon; and males and females from Dehra Dun, "on grass."

The males evidently are the males of this species. The *legs* are entirely yellow, the knees with two dark spots. *Genitalia* reddish yellow; the upper forceps large, bifid, the under pair small, both with short black pubescence.

*Heligmoneura trisignata*, ♂ ♀, sp. n.

Type (male), type (female), and paratypes (two males, one female), all from Veddichalam, S. Arcot District (P. G. Coll.), one paratype (male) from Adoni, Bellary District (Y. R. Coll.), in I. E. E. Coll.

A species nearly allied to *Heligmoneura indianus*, Ricardo, from Katajiri, S. India, but distinguished by the *genitalia* in the male and by the strong, long, black bristles on the fore tibiae, whereas in the above species there are only weak yellowish bristles. *Abdomen* with a distinct series of three brown spots, median and side ones, with stout yellow bristles at the sides. *Genitalia* reddish brown; the upper forceps large, club-shaped, with black pubescence; the lower pair reddish yellow, with long slender apices. *Ovipositor* about as long as the last two segments; the last segment in the male is raised on its underside. The bristles on the fore femora below are black. *Wings* with the transverse vein below the middle of the discal cell.

Length, ♂ 13-15, ♀ 15 mm.

*Tolmerus*, Loew.

Linn. Ent. iv. p. 94 (1849).

The only species recorded from the Oriental Region are *Tolmerus nicobarensis*, Schiner (see remarks on this species under my new species *Tolmerus parvus*), and *Tolmerus batavensis*, de Meijere, Tijd. Ent. lvi. p. 61 (1914), not represented in the Brit. Mus. Coll., described as 10 mm. in length. *Legs* black, reddish-yellow haired below the tibiae and tarsi; the bristles chiefly black, with long weak white bristles on the underside of femora and on the fore tibiae. *Moustache* black, yellow below. *Scutellum* with four black bristles. *Abdomen* black, with pale segmentations.

Also *Tolmerus agilis*, Wied, a male described from Java with a white moustache, not represented in the Brit. Mus. Coll.

From the South African Region only, *Tolmerus pammelus*, Speiser, Schwed. Zool. Exped. p. 101 (1910), from E. Africa, has been described.

*Tolmerus pammelus*, ♂ ♀, Speiser.

Schwed. Zool. Exped. p. 101 (1910).

One female from Mara River, Masai Reserve, Brit. E. Africa, 10. 11. 14 (*Capt. A. C. Luckman*).

A species distinguished by its wholly black legs. *Moustache*

and antennæ black. Bristles on legs entirely black, with the exception of a few yellow hairs on the underside of hind femora.

Length, ♀, 17 mm.

*Tolmerus nigripes*, ♂ ♀, sp. n.

Type (male), type (female), and a series of males and females from Mt. Mlanje, Nyasaland (S. A. Neave and J. B. Davey).

A small black species, distinguished from *Tolmerus pam-melus*, Speiser, by the absence of any close-lying yellow pubescence on the legs, and the bristles on the legs are chiefly white.

Length, ♂ 12-13, ♀ 11-13 mm.

*Male*.—Face covered with glistening yellow tomentum. *Moustache* composed of yellow bristles below and black ones above and at sides, placed on the large round tubercle. Space between moustache and antennæ devoid of any hairs. *Antennæ* black, the first joint with black bristly hairs, the second joint small, the third longer than the first two together, and the arista about half its length. *Forehead* with a few black hairs. *Thorax* covered with greyish-yellow tomentum, and with a very distinct black median stripe, cleft anteriorly, sides with two black spots; pubescence on dorsum consists of black hairs and black bristles, which latter reach the median suture, a row on each side. *Scutellum* same colour as thorax, with yellow hairs and two black bristles. *Abdomen* appearing the same colour as thorax at the first appearance, the brown spots on each segment not very dark, the segmentations paler; pubescence on dorsum black, at sides yellow. *Genitalia* small, black, the upper forceps stout, conical, the lower pair very short, all with some black hairs and black or yellow bristles below and at apices of upper forceps. *Legs* wholly black; the coxæ with greyish tomentum, the bristles yellow, rather long, a few black ones on the tarsi; some short pale yellow hairs on the underside of femora and sides of tibiæ, but not appressed; the hind tibiæ are reddish at their extreme base; the yellow bristles are longest on the fore tibiæ. *Wings* clear, veins dark brown, the small transverse vein about the middle of the discal cell, the posterior branch of the third vein with a slight bend in the middle.

*Female* identical. *Ovipositor* black, as long as the last two segments.

*Tolmerus rubripes*, ♂ ♀, sp. n.

Type (male), type (female), and a series of males and females from Mlanje, Nyasaland (S. A. Neave), 1913.

A small species distinguished from *Tolmerus pammelus*, Speiser, and *Tolmerus nigripes*, sp. n., by the red colour of the tibiæ at base and the curve in the posterior branch of the third vein is more pronounced.

Length, ♂ 13-14 mm., ♀ 13-14 mm.

Male similar to *Tolmerus nigripes*, sp. n., except in the following particulars:—

*Thorax* with a third black at sides anteriorly. *Scutellum* with fewer or no yellow hairs. *Abdomen* with brighter-coloured segmentations, and the yellow bristles at sides are very noticeable. *Genitalia* rather smaller; the upper forceps slighter, and the lower ones a trifle longer, no black bristles are present; pubescence short, yellow. *Legs* black; the tibiæ dull red on basal third; the tarsi reddish yellow at base of joints, the red colour is more extended on the hind tibiæ; pubescence and bristles yellow as in *Tolmerus nigripes*. *Wings* clear, but with pale grey shading at apex and on hind border.

*Female* identical. *Ovipositor* shorter.

*Tolmerus hirsutus*, ♂ ♀, sp. n.

Male (type) from Mara River, Masai Reserve, Brit. E. Africa (Capt. A. C. Luckman); female (type) from same locality.

A species distinguished by the short pale pubescence on the black legs; the tibiæ being reddish yellow at their base, extending on the outer side nearly to the apices of the middle and hind pair, the bristles are chiefly white on the fore legs, and black and white on the others; the fore femora with long white hairs and a few weak bristles.

Length, ♂ 12, ♀ 13 mm.

*Male*.—*Face* with moustache black above, a few white hairs below. *Thorax* with three black side-spots. *Scutellum* denuded. *Abdomen* has a faint longitudinal stripe down the middle, composed of small brown spots superimposed on the large faintly brown ones. *Genitalia* black; the upper forceps stout, notched at their apices with dull yellow pubescence and small black bristles on the lower edge of the under pair. *Wings* greyish, the curve in the lower branch of the third vein not pronounced.

*Female* identical. *Moustache* chiefly black. *Ovipositor* black, not quite so long as the last two segments.



*Tolmerus angularis*, ♂ ♀, sp. n.

Type (male), type (female), from Mussoorie, India, Oct. 1907 (Imms Coll.), and two other females from same locality and collection.

A species distinguished by the very sharp curve in the posterior branch of the third vein of wing; a black species with reddish-yellow pubescence on the abdomen and the legs. *Moustache* in the male black with reddish-yellow bristles intermixed below, in the female chiefly black. *Abdomen* with distinct grey tomentose segmentations.

Length, ♂ 15, ♀ 15-16 mm.

*Male*.—*Face* bronze-green, covered with yellowish tomentum, the tubercle large, no hairs beyond the moustache towards the antennæ. *Palpi* black-haired. *Moustache* reddish yellow. *Antennæ* black, the first two joints with black bristly hairs. *Forehead* with many long, black, rather bristly hairs. *Thorax* bronze-green, with a row of black hairs down the centre and on posterior half, elsewhere the pubescence is short, black, the ashy-grey tomentum forms two indistinct stripes and is present on the sides. *Scutellum* with fine, rather long, black hairs, a few reddish-yellow ones intermixed, no bristles on posterior border. *Abdomen* blackish, with short black pubescence, and with long reddish-yellow hairs on sides and below, and the same-coloured bristles at the segmentations on sides. *Genitalia* small, covered with black hairs above and reddish-yellow ones below. *Legs* black; the fore femora and fore tibiæ with long thick yellow hairs below, the other femora with the same, not so thick; the tibiæ all with long yellow bristles intermixed with black ones; the hind femora armed with many short yellow bristles below; all tarsi with black bristles only. *Wings* clear with grey shading, leaving the centre clear, the small transverse vein situated beyond the middle of the discal cell.

*Female* identical, with fewer, though longer, yellow bristles on the underside of the hind femora. *Scutellum* with only black hairs. *Ovipositor* compressed, black, shining, short, about as long as the last two segments.

*Tolmerus parvus*, ♂ ♀, sp. n.

Type (male) from Nuwara Eliya, Ceylon (Yerbury Coll.), type (female) from Nuwara Eliya, Ceylon (*E. E. Green*), and a series of males and females from the same and other localities in Ceylon.

A small blackish species, the abdomen appearing dusky

golden yellow in well-preserved specimens by reason of the coloured tomentum and hairs. Legs, moustache, and antennæ black.

Length, ♂ 12½-14, ♀ 13-14 mm.

*Male*.—*Face* blackish with yellowish tomentum, tubercle large. *Moustache* composed of fine black hairs and a few white ones sometimes below, these hairs reaching nearly to the antennæ. *Palpi* black-haired. *Beard* white. *Antennæ* black, the first two joints with black hairs, the third as long as the two joints together; the arista stout, as long as the third joint. *Forehead* with a few weak black hairs. *Hind* part of head with stout black bristles. *Thorax* in type denuded, in the others brownish with a darker divided median stripe and with side-stripes; pubescence black with longer black hairs and bristles posteriorly and on the median stripe. *Scutellum* with short black hairs and three or four black bristles on the border. *Abdomen* blackish covered with yellow tomentum and the segmentations are yellowish; pubescence black, with yellow bristles on the segmentations towards the sides; underside with soft yellow hairs. *Genitalia* small, pointed, black, the upper forceps long, simple, club-shaped, under pair in proportion large, but still shorter than the upper pair, both are black, shining, with black hairs. *Legs* black, with some yellow hairs intermixed with black hairs on the underside of the femora, and some short yellow pubescence on the uppersides; tibiæ and tarsi with black hairs and bristles, the hind tibiæ and tarsi with some appressed pale yellowish pubescence. *Wings* clear, grey on the apices and fore and post borders, leaving only centre of wing clear, the posterior branch of the third vein with rather a sharp bend in the middle, the small transverse vein is just beyond the middle of the discal cell.

*Female* identical, the hairs of the forehead are more numerous and stronger. *Ovipositor* short, black, not so long as the last two joints together.

This species is probably near *Tolmerus nicobarensis*, Schiner, whose description is rather insufficient; this species is larger and the bristles on the abdomen are yellow.

*Machimus pallipes*, ♂ ♀, sp. n.

Type (male) from Dharmoti, Kumaon, type (female) from Bhowali, Kumaon, and two other females from Bhowali and Dharmoti. All in Forest Research Zool. Coll. (A. D. Imms).

A species with a reddish-yellow-looking abdomen; femora

black, legs otherwise deep reddish. Moustache black and yellow. Wings large, clear, yellowish on fore border in the females.

Length, ♂ 17, ♀ 18–24 mm. The male type is distorted somewhat, appearing immature.

*Male*.—*Face* bronze-brown, covered with glistening yellow tomentum; tubercle large, carrying the moustache composed of yellow bristles and black ones above. Beard of soft yellow hairs. *Palpi* yellow-haired. Face bare of pubescence above tubercle. *Antennæ* reddish (the third joint is wanting) with bristly black hairs below. *Forehead* same colour as face with bristly black hairs. Hind part of head with yellow and black bristles. *Thorax* bronze-coloured with yellowish tomentum, stripes are visible; pubescence black and black bristles on posterior part. *Scutellum* covered with glistening yellow tomentum, and with weak yellow hairs, five stout black bristles on edge, and traces of yellow weaker ones. *Abdomen* brownish covered with bright yellow tomentum, which is brighter on the segmentations; pubescence yellowish, long yellow bristles on the segmentations; underside with soft yellow hairs. *Genitalia* black, the upper forceps large, club-shaped, the lower pair about half as long, the last segment produced, with thick orange-yellow hairs covering its apical border and reaching beyond the lower forceps; pubescence elsewhere is yellowish. *Legs* long and fairly stout; femora brownish with soft yellow hairs below, the fore pair unarmed, uppersides of femora with short yellow pubescence, a few black hairs are visible on the uppersides of the fore femora; tibiæ and tarsi dull yellowish with yellow pubescence and long yellow hairs on the tibiæ, all bristles black; underside of first joint of fore tarsi armed with many short black bristles. *Wings* grey, only clear in the centre, the small transverse vein beyond the middle of the discal cell.

*Female* differs in the colouring of the legs somewhat, but the male is probably not fully developed. Femora entirely black, a few black hairs are intermixed with the yellow ones below on the fore femora, which have also stout black bristles on their outer sides, not present in the male, the two black bristles below at apex are much stouter; tibiæ and tarsi brighter red. *Antennæ* chiefly black (third joint wanting). *Palpi* black-haired. *Thorax* darker with grey tomentum. *Scutellum* with six black bristles on edge. *Abdomen* brownish, covered with the same yellow tomentum, pubescence short, chiefly black, segmentations with yellow bristles as in male, the ground-colour is more apparent on the basal segments. *Ovipositor* black, short. *Wings* with yellow veins.

*Machimus pubescens*; ♂ ♀, sp. n.

Type (male) from Gyangtse, 13,000 feet, Tibet (Tibet Expedition, H. J. Walton, 1905).

Type (female) and other males from the same locality, one from Gautok, Sikkim,

A species probably unique in this genus, with thick orange-yellow hairs covering the abdomen, the same-coloured hairs on posterior part of thorax and on scutellum. Legs black, with reddish-yellow bristles.

Length, ♂ 18, ♀ 16 mm.

*Male*.—*Face* shining black with some grey tomentum at sides; tubercle large, carrying the *moustache* composed of long soft black and yellow hairs. Beard yellowish white, very thick. *Antennae* blackish, the first two joints with black hairs, thickest on the first one, third long. *Forehead* covered with grey tomentum, and with long black hairs at sides and on ocelligerous tubercle. Hind part of head with black hairs only slightly bent over. *Thorax* blackish with two or three yellowish tomentose stripes; pubescence short, black, but a median line of hairs are longer, almost *Dysmachus*-like; on the posterior part of thorax the long bristles are chiefly yellow with unusually many yellow hairs as long as those on the scutellum; in all the other male specimens these hairs are black, and most of the bristles yellow; sides covered with grey tomentum and with whitish hairs and some strong yellow bristles. *Scutellum* covered with a thick tuft of yellow hairs on its posterior border, bending inwards; a few black hairs or weak bristles are visible on its inner side. *Abdomen* black, shining, but, with the exception of the dorsum of the first segment, it is entirely covered with long yellow hairs like those on the scutellum; they are more orange in colour above, becoming paler at sides and on the underside. *Genitalia* short, black, shining, with yellow pubescence; the upper forceps stout, ending in a point curved downwards; the lower pair shorter but stout; between them appear three reddish and black long processes, the distinctive characteristic of the genus; the shape of the underside of last segment is not very pronounced, as it is only very slightly produced in the middle, but is raised with a fringe of dense white hairs. *Legs* stout, black, with a trace of reddish knees; the underside of fore femora with thick soft black hairs, the middle pair the same, the hind pair with white hairs and with stout reddish-yellow bristles; uppersides of femora with whitish hairs; tibiae with whitish hairs, long and black on the underside of the fore pair; tarsi with chiefly black hairs, all the

bristles on the legs stout, reddish-yellow, and numerous, except on the tarsi. *Wings* clear, grey at apex and in the middle of the cells, veins brown, small transverse vein beyond the middle of the discal cell, the posterior branch of cubital vein with a slight bend inwards.

*Female* identical. *Thorax* with hairs on posterior part chiefly yellow. *Abdomen* with the orange-yellow hairs not quite so thick on the apical segments. *Ovipositor* small, black, similar to those of the typical species of the genus. *Legs* with chiefly black bristles on the tarsi, whereas in the male the yellow are nearly as many as the black. *Wings* with some of the transverse veins clouded as in the male.

This species somewhat resembles *Machimus pallipes*, sp. n., but the genitalia are different and its greater pubescence distinguishes it from this and any other species of *Machimus*; the abdomen is also devoid of bristles. It might possibly require to be placed in a new genus.

*Machimus excelsus*, ♂ ♀, sp. n.

Type (male), type (female), from Gyangtse, 13,000 feet (Tibet Expedition), 1904, and another male and female. Also a female from Gantok, Sikkim (Tibet Expedition), 1904.

A species allied to *Machimus hirtipes* and *khasiensis*, Ricardo, and in many respects related to *Machimus pubescens*, sp. n., but very much less hairy. A blackish species with black legs; tibiae and tarsi partly deep red. Moustache black and yellow.

Length, ♂ 18-19, ♀ 18-21 mm.

*Male*.—*Face* blackish, covered with greyish tomentum; tubercle large bearing moustache composed of black weak bristle-like hairs above, at sides and on oral opening enclosing soft yellow hairs. *Palpi* with black hairs. Beard yellowish white. *Antennae* black, with black bristly hairs on the first joint and a few on the second, third long. *Forehead* with black long hairs. Hind part of head with black bristles. *Thorax* black with black pubescence and bristles, disposed as in *Machimus pubescens*. *Scutellum* covered with stout black long bristles on the dorsum and on border with fringe of yellow bristles. *Abdomen* black with yellow hairs, thickest at sides; dorsum with short black and yellow pubescence; the basal segments black, shining, with less pubescence. *Genitalia* the same as those of *Machimus pubescens*, not quite so hairy, the ventral process below a little more apparent. *Legs* black, the fore and middle tibiae almost wholly reddish,

the hind pair with a black stripe ; tarsi obscurely reddish, the first wholly so ; fore femora with soft black hairs below, middle pair with only a few black hairs and with black bristles, the hind pair with short white hairs and a row of strong black bristles ; fore femora with black hairs on dorsum ; pubescence elsewhere on legs short, white, but fore tibiae with chiefly long black hairs ; tarsi with short black hairs, all bristles black. *Wings* clear, grey at apex and in centre of cells ; bend on posterior branch of cubital vein very slight.

*Female* identical. *Moustache* almost wholly yellow. *Forehead* also with a few white hairs intermixed with the black ones. *Thorax* with white hairs on the posterior part and at its sides, with the black hairs and bristles. *Scutellum* with the yellow bristles on border more like soft yellow hairs. *Abdomen*, less denuded than in male, shows grey tomentum at sides. *Ovipositor* short, black. *Legs* have the hind tibiae wholly red, except at extreme apices.

*Machimus rufipes*, ♂ ♀, sp. n.

Type (male) from Dehra Dun on wing in Forest Research Zool. Coll.

Type (female) from Kangra Valley, Punjab (Dudgeon Coll.), in Brit. Mus. Coll. ; and another male from Takula, Kumaon, in India Forest Research Zool. Coll.

A large robust species with reddish tibiae and tarsi. Scutellum with four to six large stout black bristles on its outer border ; fore femora with no bristles below.

Length, ♂ 20-24, ♀ 25 mm.

*Male*.—*Face* blackish covered with pale yellow tomentum, tubercle large. *Moustache* composed of yellow bristles with some black ones near the oral opening. *Palpi* black-haired. In the space between moustache and base of antennae only two or three white hairs above moustache. *Antennae* blackish, with black bristly hairs, third joint wanting. *Forehead* with white bristly hairs. Hind part of head with very stout black bristles. *Thorax* blackish covered with grey tomentum, the usual stripes distinct ; pubescence on dorsum black, with a few white hairs, on the posterior part besides the usual black bristles are numerous white hairs intermixed. *Scutellum* same colour as thorax ; dorsum covered with white hairs, armed with six bristles in the type, but only four in the other male. *Abdomen* blackish with grey tomentum and the usual dark spots, segmentations slaty grey ; pubescence on dorsum black on the dark spots, white on the segmenta-

tions and at sides, with white bristles at sides; underside with weak white hairs. *Genitalia* large, the last segment on its underside produced, with two obtuse teeth on its truncated end, from each of which proceed long white hairs; upper forceps large, black, with white hairs, the lower pair small, black, the middle processes reddish. *Legs* with black shining femora, clothed with whitish pubescence and long white hairs on underside of fore femora; tibiæ reddish with apices darker, also clothed with yellowish-white pubescence and tarsi the same, all bristles black; the fore tibiæ with some longer whitish hairs below. *Wings* with dark shading in the centre of cells.

*Female* identical. *Ovipositor* short, black, a little longer than the last segment.

#### CINADUS, v. d. Wulp.

Tijd. v. Ent. xli. p. 139 (1898).

This genus was founded for two species from Sumatra and Java, and from Celebes, characterised by the very abrupt bend in the posterior branch of the third vein, the nakedness of the *abdomen*, and the small facial tubercle. *Genitalia* in males very large. The material in the Brit. Mus. Coll. is very scanty, but one new species has been added by Edwards and two by de Meijere, and five Walker species are now transferred to this genus, which is confined as yet to the Oriental and Australasian regions. The facial tubercle shows a certain amount of diversity in shape and size. The species seem very nearly allied to each other. De Meijere's species, *Cinadus rufipes*, seems probably identical with Walker's *Cinadus laevis*. The other species, *Cinadus forcipatus*, from Sumatra, is described as near *C. spretus*, but differs in the shape of the genitalia.

*Cinadus spretus*, v. d. Wulp, from Sumatra and Java, is smaller; antennæ darker; the apices of fore femora black.

*Cinadus tenuicornis*, ♂ ♀, Walker.

Proc. Linn. Soc. London, iv. p. 108 [*Asilus*] (1860).

? *Cinadus spurius*, v. d. Wulp, Tijd. v. Ent. xli. p. 140, pl. v. figs. 1-4 (1883), et xlii. p. 48 (1890).

Type (female) from Makassar. Two males from Eastern Archipelago, according to the card-label only.

These specimens appear identical with v. d. Wulp's species, also from Celebes. The males are similar to the figures given by v. d. Wulp, the *genitalia* being large, black. *Antennæ* yellow. *Moustache* yellow with some black bristles,

but in the female wholly yellow. *Face* with a distinct tubercle on lower part of face. *Abdomen* black with yellow segmentations. *Legs* yellow with the apices of the middle and hind femora black, the latter with black rings, which in these specimens unite with the black apices; hind tibiæ black on the outer side; tarsi black.

Length, ♂ 21, ♀ 18 mm.; v. d. Wulp gives 17 mm.

A female from Dohra Dun, in Forest Research Zool. Coll., has lately been sent to me which seems identical with Walker's type; the hind tibiæ are rather paler in colour and the moustache is black and white as in the male.

It will be of interest to observe in the future whether this species is common in India, and how wide its distribution is. A species from Ceylon in the Brit. Mus. Coll. also appears to belong to this genus.

*Cinadus debilis*, ♀, Walker.

Proc. Linn. Soc. London, i. p. 13 (1856) [*Asilus*].

Type (female) from Malacca.

A species very near *C. tenuicornis*, Walker, but the *legs* are darker, the black colour on the hind femora extending below on the whole length and the hind tibiæ are black except at the base. *Moustache* chiefly black. *Face* with a smaller tubercle. *Abdomen* darker. The angle on the branch of third vein is very pronounced.

Length 17 mm.

*Cinadus lævis*, ♀, Walker.

Proc. Linn. Soc. London, v. p. 236 [*Asilus*] (1861).

? *Cinadus rufipes*, ♂, de Meijere, Nova Guinea, ix. p. 338 (1913).

Type (female) from New Guinea.

A species nearly allied to *Cinadus tenuicornis*, Wlk., but the *legs* are wholly yellowish and the *moustache* is yellow. *Face* concave in the middle with hardly any tubercle below.

Length 18 mm.

The male described by de Meijere from Bivak Island is very probably the male of this species. *Genitalia* are described as black, large, with black hairs, and 15 mm. in length.

*Cinadus didymoides*, ♀, Walker.

Proc. Linn. Soc. London, vii. p. 208 (1864) [*Asilus*].

Type (female) from Menado, Celebes.

A species very near *Cinadus lævis*, Wlk., but the *face* is



very similar to that of *Cinadus tenuicornis*, Wlk.; the moustache has some black bristles intermixed with the yellow.

Length 18 mm.

*Cinadus flagrans*, ♀, Walker.

Proc. Linn. Soc. London, i. p. 116 [*Asilus*] (1857).

Type (female) from Borneo (Walker Coll.).

A species nearly allied to *Cinadus tenuicornis*, Wlk., the colouring of the legs and the moustache identical. Facial tubercle the same, but the abdomen has the first segment transparent yellow at base, and hardly perceptible lighter segmentations.

Length 10 mm.

*Cinadus genitalis*, Edwards.

Journ. Fed. Malay States Museums, viii. (iii.) p. 34 (1919).

A species (male only) with the abdomen black, the segmentations greyish. Genitalia very large, complicated.

Legs yellow with the hind femora almost wholly black. Moustache yellow.

Length 19 mm.

From West Sumatra.

*Cinadus complens*, Walker.

Proc. Linn. Soc. London, v. p. 281 (1861) [*Asilus*].

Type (female) from Batjan, and another female from Gilolo.

Male from Menado, labelled *discutiens*, which is only a MS. name.

A wholly black species. Face in male light yellow, with a large tubercle taking up most of the face. Moustache black in male, black and white in female. Abdomen dark with narrow grey segmentations.

Length 10 mm.

*Cinadus biligatus*, Walker.

Proc. Linn. Soc. London, vii. p. 224 (1864) [*Asilus*].

Type (male) from Waigiou and a female from New Guinea.

This species has not the sudden bend in the posterior branch of the third vein, the chief characteristic of the genus, and the genitalia of the male are small, not large and complicated as in the other species of this genus; but as it so nearly resembles *Cinadus laevis*, Wlk., which possesses the

bend in the wing, I leave it here for the present. *Antennæ* are black on the first joint, the second joint is reddish, and the third is wanting; the bend in the vein of wing is represented by a small concave bend.

*Face* with small tubercle on lower third of face.

Length, ♂ 20, ♀ 18 mm.

The following genera recorded from the South African Region are not represented in the Brit. Mus. Coll.:—

*Rhadiurgus* with one species from Abyssinia (*notatus*, Bigot); *Erax* with one species from Africa (*albiceps*, Macq.); and *Teretromyia* with one species from Madagascar (*cothurnata*, Bigot). *Protophanes* with two species.

The following genera recorded from the Oriental Region not represented in the Brit. Mus. Coll. are:—*Erax* with one species from Bengal (*rufiventris*, Macq., and *integer*, Macq., from Manila); *Erax curiatis*, Wlk., from Nepal, is not to be found and should be deleted from the list. *Antipalus kochi*, de Meijere, from New Guinea, and *Antipalus wiencekii*, v. d. Wulp, from Timor and Java; *Eccoptopus impiger*, v. d. Wulp, from Celebes; *Rhadiurgus bifidus*, F., from Tranquebar; *Threnia acanthura* and *microtelus*, v. d. Wulp, from Java, and *Stenoprosopis diardii*, Macq., from Bengal; *Philonicus longulus*, from Celebes, and *mgrosetovus*, v. d. Wulp, from Sumatra, and *Lecania tabescens*, Rondani, from Borneo.

IV.—*Coleoptera, Erotylidæ and Endomychidæ, from the Seychelles, Chagos, and Amirantes Islands.* By GILBERT J. ARROW.

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[Plate III.]

[THIS work forms part of the results of the Percy Sladen Trust Expedition to the Indian Ocean under Professor J. Stanley Gardiner, F.R.S., in 1905 and 1908–9. Most of these results have appeared in a special series of volumes, Trans. Linn. Soc. Lond., ser. 2 (Zool.), vols. xii.–xviii., the last of which is at present (1922) in course of publication. It has not, however, been possible to include all the reports in that series, and I am indebted to the Editors of the ‘Annals

and Magazine of Natural History' for allowing this paper, as well as several previous papers, to appear in their periodical. The greater part of the material under review, especially of Endomychidæ, was collected by the writer in the endemic forests of the mountains of the Seychelles during the second expedition (1908-9), and this part includes two genera (one of them new) and several species which are probably endemic; but the collection also contains several wide-ranging species which were taken not only in the Seychelles but also in some of the coral islands of the Chagos, Amirantes, and Farquhar Groups, by the members of the earlier (H.M.S. 'Sealark') Expedition of 1905. The drawings for the figures have been made by Miss O. F. Tassart. Two of the Endomychidæ were first discovered in the Seychelles by Professor A. Brauer, and were reported on by Kolbe in 1910: references to his work are given below.—HUGH SCOTT.]

### Erotylidæ.

Of the four representatives of this family, three are wide-ranging species previously known from other regions and the fourth (congeneric with two of the latter) is known from one specimen only. All are of a highly specialised type and must be considered to be of relatively recent introduction.

### Genus *Euxestus*, Wollaston.

The species of this genus show a marked preference for the islands of the globe, upon which they are commonly found in great abundance, whereas from continental localities I have seen only a few solitary specimens. The late M. Fauvel recorded examples introduced into France in a cargo of ground-nuts. Owing to the peculiarity of their distribution, the nomenclature of the species is in an extremely tangled state. Fauvel proposed a new family for the genus, calling the insects Pleosomidæ, on the unfortunate assumption of their generic identity with a very different insect, *Pleosoma*. Although he afterwards corrected this mistake (Rev. Ent. 1895, p. 105), he continued to use the name Pleosomidæ in his later paper of 1903. *Pleosoma* is so fundamentally different, in the organs of the mouth and other features, that it is impossible to associate *Euxestus* with it in any way. In my opinion this genus is best regarded as an aberrant member of the Erotylidæ, distinguished chiefly by the solid club of the antenna.

The recent Catalogue of the Erotylidæ includes (under the name *Tritomidea*) a part only of the known species of *Euxestus*,

confused with other and unrelated insects, and it is perhaps permissible to include here a list, with what I believe to be the correct synonymy :—

*æneipennis*, Fauv., 1903.

*bivulneratus*, Lea.

*globosus*, sp. n.

*parki*, Woll., 1858.

= *erithacus*, Chevr.

*basalis*, Mots.

*oblongus*, Mots.

*peregrinus*, Belon.

*minor*, Sharp.

*piceiceps*, Gorb.

*phalacroides*, Woll., 1877.

*angustus*, Arrow.

*punctatus*, Lec. (*Hypodacne*), 1875.

*rubripes*, Reitter (*Tritomidea*), 1879.

*tasmaniae*, Lea (*Tritomidea*), 1910.

*translucidus*, Mots. (*Tritomidea*), 1859.

In the New Zealand species, *E. rubripes*, Reitt., a comparatively primitive stage is found, the full number of eleven joints being distinctly visible in the antenna. *E. tasmaniae*, Lea, appears, from the description, to be similar. In the other species the last joint is more or less completely telescoped into the enlarged preceding one, the ninth is only a little enlarged, and the two or three following the elongate third joint are partially fused with it. A feature of all the species is the hollowing out of the large scape behind, in correspondence with the convexity of the eye.

### 1. *Euxestus parki*, Woll.

This is the typical and generally-distributed species of the genus.

*Loc.* Chagos and Seychelles Is. Chagos : Egmont Atoll, 1905, two examples. Seychelles : Praslin, from between leaf-bases of a growing Coco-de-Mer palm (*Lodoicea*) in the Vallée de Mai, 28. xi. 1908, three specimens.

### 2. *Euxestus phalacroides*, Woll.

Described by me in 1917 from South Africa, as *E. angustus*, this proves to be identical with the form previously discovered in the island of St. Helena. Dr. Scott found it abundantly in the Seychelles, and it will no doubt be found in the future in other localities, rendering this remarkably scattered distribution less surprising.

*Loc. Amirantes and Seychelles Is.*

Amirantes : Poivre, Desroches, and Darros islands, five examples ; one specimen from Poivre is marked "in rotten cocos, 10. x. 1905."

Seychelles : Mahé, Long Island, Praslin, Dennis. Mahé : Cascade Estate, about 1000 ft., thirty specimens. Long Island : vii. 1908, two examples. Praslin : Côtes d'Or Estate, xi. 1908, one example. Dennis Island : viii. 1908, one specimen (*Fryer*).

3. *Euxestus globosus*, sp. n.

Niger, nitidissimus, pedibus, antennis palpisque rubris : late ovalis, valde convexus, corpore supra minute et parce, haud regulariter punctulato, femoribus tibiisque latis, tarsi parum brevibus ; pronoto postico medio fortiter lobato : scutello minuto, acutissimo ; elytrorum epipleuris latissimis ; corpore subtus haud perspicue punctato.

Long. 2·3 mm.

This is more rotund in form than either of the two preceding species, rather more so than *E. translucidus*, Mots., and nearly as globular as *E. bivulneratus*, Lea. It is also extremely smooth and glossy both above and beneath, without trace of striation or seriate puncturation, the punctures, where traceable, being very fine and scattered. The deep distinct punctures visible at the sides of the metasternum in *E. parki*, and the very large ones at the sides of the first ventral segment of *E. phalacroides*, are alike absent. The prosternum is slightly tumid between the coxæ, but not triangular, as in *E. phalacroides*. The first ventral segment is almost as long as the succeeding three, and the elytral epipleuræ are very wide. The femora are very broad and flat, the tibiæ moderately, and the tarsi rather, slender, the latter with the first joint strongly produced. The antennæ are short, the solid club a little transverse, as in *E. phalacroides*, but the joint preceding it only a little broader than the previous one. The basal lobe of the pronotum is rather strong, and the scutellum is very small, narrow, and acutely pointed.

*Loc.* Seychelles. Silhouette : from plateau of Mare aux Cochons or the forest immediately above, over 1000 ft., one example.

Genus *EIDOREUS*, Sharp.

*Pseudalexia*, Kolbe, Mitt. Zool. Mus. Berlin, v. 1910, p. 34.

There seems little doubt that this is the form described by

Prof. Kolbe and assigned by him to the subfamily Sphaerosominiæ of the Endomychidæ. His reasons for this are not apparent. Only a single species of *Eidoreus* is known, and this has been recorded only from the Hawaiian Islands.

#### 4. *Eidoreus minutus*, Sharp.

*Pseudalexia sechellurum*, Kolbe, l. c.

It seems likely that this may prove, like the related species of the previous genus, to be a widely scattered island form. It was found by Brauer in an ants' nest under a stone, in Praslin (see Kolbe), and some of Dr. Scott's examples were also, as stated below, found with ants.

*Loc.* Seychelles: Mahé, Long Island, Praslin. Mahé: Cascade Estate, about 1000 ft., seven examples. Long Island: four specimens found in company with other Coleoptera and Lepismatidæ, in a nest of the ant *Pheidole punctulata*, Mayr (A. Forel det.), in a decayed log, 18. vii. 1908. Praslin: Côtes d'Or Estate, xi. 1908, three specimens.

#### Endomychidæ.

Two species, attributed to new genera, represent this family in Kolbe's enumeration, one of them being the minute Erotylid, *Eidoreus minutus*, Sharp, just dealt with. The Endomychidæ of Dr. Scott's collection amount to five species, of which one only is known from elsewhere (*Trochoideus desjardinsi*, Guér.). Three of the remainder, including *Cyrtomychus coccinelloides*, Kolbe, belong to two very remarkable genera, probably peculiar to these islands\*, and the other is assigned to a genus hitherto known only from Lord Howe Island, a spot so remote as to render it almost certain that the genus has yet to be found in many parts of the world. All the four species are highly interesting for the light shed by them on the origins of the family and the development of its characteristic tarsal structure.

#### Genus CYRTOMYCHUS, Kolbe, *op. cit.* p. 35.

This genus was described by Kolbe from a single specimen. A considerable number, belonging to two species, were taken by Dr. Scott. There seems no doubt that these belong to *Cyrtomychus*, although the structure of the tarsi is very different from that described. The feet are said by Kolbe to be cryptotetramerous and the third joint bilobed.

\* A supposition borne out by the fact that all the material of these two genera was found only in the endemic forests at high elevations.

Actually there are only three joints, the second very small and the first produced into a single narrow lobe, extending considerably beyond the second. This is entirely unlike any other tarsus known to me. The claws have a sharp-angled basal appendix, as in many of the minute forms of *Eumyrmecidae*, but this is not easily visible.

5. *Cyrtomychus coccinelloides*, Kolbe, *op. cit.* p. 36.  
(Pl. III. figs. 1, 1 a.)

The single specimen from which this was described appears to be a female. The long series brought together by Dr. Scott shows a remarkable sexual difference. The males have the apices of the elytra produced and thickened at the angle—quite unlike the elongation found in females of the genus *Eumorphus*. The only other external difference is that the fifth ventral segment is a little shorter in the same sex, which I conclude on that account to be the male. None of Dr. Scott's long series of my *C. minor* reaches the length of  $1\frac{1}{2}$  mm., given by Kolbe as that of his type. In other respects Kolbe's very brief description is not more applicable to the present than to that species, but the measurement being given with such exactitude should be sufficient to decide the point. This is evidently a very common insect in the locality in which the type was found, and it is highly improbable that that specimen belongs to yet another species.

*Loc.* Seychelles. Silhouette, Mahé, Praslin. The 38 ♂♂ and 50 ♀♀ were found exclusively in the endemic forests at high elevations, and in all months from August to March. Silhouette: near Mont Pot-à-eau, ca. 1500 ft.; Mare aux Cochons and forest above, over 1000 ft. Mahé: high forest of Morne Blanc and Pilot, ca. 2000 ft.; high forest between Trois Frères and Morne Seychellois, 1500–2000 ft.; Mare aux Cochons district, 1000–2000 ft.; forest above Cascade Estate, including Mount Harrison, 1000–2000 ft. Praslin: Côtes d'Or Estate, Coco-de-Mer (*Lodoicea*) forest.

6. *Cyrtomychus minor*, sp. n. (Pl. III. fig. 2.)

Nigro-fuscus, nitidus, pedibus antennisque (clava excepta) flavis: rotundato-ovatus, convexus, supra ubique sat parce punctatus et breviter griseo-hirtus, antennis brevibus, pedibus modice gracilibus, capite fere laevi; pronoto convexo, minutissime et parvissimo punctato, lateribus valde rotundatis, antice sat lato, postice angustissimo, marginatis, antrorsum fortiter, retrorsum leviter,

contractis, angulis omnibus obtusis, basi profundo sulcato; scutello lato; elytris sat latis, fortiter haud crebre punctatis; antennarum articulo primo magno, 2 ovali, 3 paulo elongato, 4-7 transversis, 10 haud longiore quam latiore.

Long. 1.5 mm.

This is smaller than the typical species. It is also less deep black in colour, less broad in shape, with more strongly punctured elytra and shorter hairy clothing. The sides of the prothorax are more evenly rounded and its base is rather less broad. The legs are scarcely as slender as those of *C. coccinelloides*, and the antennæ decidedly less so. Joints 4 to 7 of the latter are very short and closely connected, and the terminal joint of the club is not at all elongate, as it is in the other form.

*Loc.* Seychelles. Silhouette, Mahé, Praslin. The 27 examples were found only in the high endemic forests, including some of those on the mountain summits, September to February. Silhouette: Mare aux Cochons and forest above, over 1000 ft. Mahé: high forest of Morne Blanc and Pilot, ca. 2000 ft.; Cascade Estate and forest above, 1000 ft. and over; forest of rather stunted Capucin (*Northea*) trees on summit of "Montagne Aune Major" in the Mare aux Cochons district, 2000 ft. or more; from between leaf-bases of a growing *Stevensonia*-palm on summit of Mt. Sebert, ca. 2000 ft., 28. xii. 1908 (one specimen). Praslin: Coco-de-Mer (*Lodoicea*) forest on Côtes d'Or Estate.

### Genus GEOENDOMYCHUS, Lea.

This genus has recently been described by Mr. Arthur Lea for a tiny insect found in Lord Howe Island, and one taken in the Seychelles by Dr. Scott shows such a remarkable resemblance to that species, not only in its superficial aspect but in its anatomical characters, that, in spite of differences such as an additional joint in the antenna, I think there can be no question as to the wisdom of emphasising the close correspondence between them by referring the new form to the same genus. The remoteness of their respective habitats is surprising, but it may be expected that the discovery of others of these minute Endomychidæ, so few of which are yet known, will make it less so.



7. *Geoendomychus oculatus*, sp. n. (Pl. III. fig. 3.)

Fulvo-brunneus, pedibus antennisque flavis, harum clava obscuriore: hemisphericus, nitidus, sat dense erecte griseo-setosus; capite sat lato, oculis magnis, pronoto lato, lateribus rotundatis, angusto marginatis, angulis obsolotis, foveis basalibus profundis, ad medium attingentibus, basi toto marginato, medio late lobato; scutello late triangulari; elytris crebre haud seriatis punctatis, stria suturali impressis; antennis 10-articulatis, articulis duobus basalibus sat magnis, articulo 3 angusto, 4 ad 7 minutis, tribus ultimis maximis, longitudine reliquis æqualibus, laxè connexis. Long. 1 mm.

The new species is practically of the same size, hemispherical shape, and light brown colour as the typical one, *G. pubescens*, Lea, and has a similar even but not serial puncturation and erect greyish pubescence upon the upper surface, the latter a little closer in *G. oculatus*. The legs and antennæ are of similar length and general form, but the last three joints of the latter are larger and the terminal one more elongate. There are ten joints, instead of nine, in all, the third and fourth joints being slightly elongate and apparently equivalent to the much longer single joint of *G. pubescens*. The eyes are much larger than in the other species, in which they are extremely small. The sides of the pronotum are strongly rounded and have narrow elevated margins, which continue a little more widely round the base. The basal foveæ are remote from the sides, gently curved, and extend to about the middle of the pronotum, and the base is broadly lobed in the middle. The scutellum is broadly triangular. The elytra have a sutural stria upon each, the apices are conjointly rounded and not at all produced, and the epipleuræ are rather broad beneath. The correlation of the parts of the sternum is almost exactly as in *G. pubescens*. The prosternum is narrow between the front coxæ, but dilated a little behind them, forming a rounded process which overlaps the mesosternum. The latter is very short but broad between the middle coxæ, which are as far apart as the hind ones, and the metasternum forms a broad lobe between the middle coxæ.

*Loc.* Seychelles. Mahe: Cascade Estate, about 1000 ft. ii.-iii. 1909, three specimens.

## ANAGRICOPHILUS, gen. nov.

Corpus ovatum, subglobosum. Caput sat magnum. Oculi prominentes, minute granulati. Antennæ sat robustæ, 9-articulatæ,

articulo primo crasso, clavato, 2 sat magno, 3 ad 6 parvis, 3 duplo longiore quam sequentibus, 7 ad 9 magnis, clavam laxè connexam formantibus, quorum 8 valde transverso. Prothorax brevis, lateribus anguste marginatis, rotundatis, angulis omnibus rotundatis, foveis basilibus longe carinatis, haud ad marginem anticam productis, basi medio profunde marginato. Scutellum triangulare. Elytra fortiter convexa, anguste marginata. Pedes modico graciles. Femora intermedia et postica paulo incrassata. Tibiæ simplices. Tarsi 4-articulati, simplices, articulis duobus basalibus subæqualibus, tertio brevi. Prosternum angustum, antrosum productum, haud dilatatum aut acuminatum. Coxæ intermediae haud distantes. Mesosternum sat anguste productum. Metasternum antice lato lobatum, rotundatum. Abdomen 6-segmentatum, segmento primo tribus sequentibus æquali. Palpi omnes crassi, maxillarium articulo ultimo breviter ovato, labialium breviter transverso, fere globoso.

It is necessary to constitute this genus for another of the minute Eudomychidæ, the known representatives of which (belonging to the genera *Clemmus*, *Exysma*, *Agaricophilus*, etc.) are very few in number and little studied. The last-named genus, containing only a single European species, appears to be that most related to the present insect. The tarsi of *Anagaricophilus* are almost the same as in that genus, consisting of four joints, the first two simple and similar, the third distinct but very short. The antennæ, however, are reduced and consist of only nine joints, the first six forming a short compact footstalk, of which the second three are very short and closely packed, and the last three are large and form a club scarcely shorter than the footstalk. All its joints are transverse, the middle one very strongly. The insect is highly convex in shape, with a broadly oval outline, the elytral epipleuræ rather broad beneath, but the upper margins narrow. The head and prothorax are relatively larger than in *Agaricophilus*, and the margins of the prothorax and elytra are not continuous, as in the latter, the adjacent angles of each being entirely rounded off. The outer margins of the pronotum are narrow, and there is no inner marginal carina, as in the other genus, the foveæ being remote from the margin, not parallel to it and extending only about two-thirds of the distance from base to front. The prosternum forms a narrow prominent process behind the front coxæ. The mesosternum is moderately long, the part lying between the middle coxæ nearly as long as it is wide, and the metasternum is only very feebly lobed in the middle. There is a sixth visible ventral segment. The claws have a rectangular dilatation at the base.

8. *Anagaricophilus pulchellus*, sp. n. (Pl. III. fig. 4.)

Niger, pedibus et antennis flavis (sed harum clava nigra) elytrisque utrinque lunula flava a baseos medio fere ad suturæ medium producta maculaque rotundata antepicali ornatis; breviter ovatus, valde convexus, nitidus, toto haud dense aut longe griseo-setosus, corpore supra sat fortiter parum crebre punctato, pronoto brevi, lateribus valde arenatis, anguste marginatis, angulis omnibus obsoletis; scutello late et obtuse triangulari; elytris stria juxtasuturali utrinque impressis.

Long. 1.5 mm.

This little species is remarkable for a colour-development very unusual in so small an insect, and is the only one amongst the smaller Endomychidæ known to me in which a pattern occurs, although the family is so notable for the strikingly-contrasted colouring of most of its larger forms. It is shining black, with the legs and the footstalk of the antenna bright yellow and each elytron ornamented with two yellow patches, one extending backwards from the middle of the basal margin and bent towards the suture, being arrested by the juxta-sutural stria and not quite reaching the middle of the length of the elytron, the second a large nearly round spot a little before the apex. The upper surface is highly convex, strongly punctured and clothed with fine and rather scanty pubescence.

*Loc.* Seychelles. Silhouette: Mare aux Cochons or plateau immediately above, over 1000 ft., ix. 1908, two specimens. Mahé: forest above Cascade, over 1000 ft., i. 1909, one example; stunted forest on summit of Mount Sebert, ca. 2000 ft., 16. i. 1909, one specimen.

Genus *Trochoideus*, Westwood.9. *Trochoideus desjardinsi*, Guérin.

*Loc.* Chagos Is., Amirantes Is., Farquhar Atoll, Seychelles. Chagos: Egmont Atoll, 1905. Amirantes: Poivre and Darros Islands, one of the specimens from Poivre being labelled "in rotten cocos, 10.x.1905." Farquhar Atoll: 1905.

Seychelles: Mahé; high forest of Morne Blanc, 1000 ft. and over; Cascade Estate, ca. 1000 ft.: Long Island, sixteen specimens were found together in July 1908, under a heap of rotting coconut husks just above the beach (*cf.* the examples from Poivre I. in the Amirantes, mentioned above).

This species is known from Southern India, Ceylon, the Malayan and Pacific Islands, New Guinea, Madagascar, and the Mascarene Is. In the Mascarenes it is recorded from Réunion and Mauritius, and has recently been received from Rodrigues (Snell and Thomasset, 1918), while the Cambridge Museum also contains some older specimens from that island.

## EXPLANATION OF PLATE III.

- Fig. 1. *Cyrtomychus coccinelloides*, Kolbe, ♂, × 23: *a*, apex of elytra of ♀, × 23.  
Fig. 2. *Cyrtomychus minor*, sp. n., × 28.  
Fig. 3. *Geosomomychus oculatus*, sp. n., × 30.  
Fig. 4. *Anagaricophilus pulchellus*, gen. et sp. n., × 25.

V.—New or little-known Tipulidæ (Diptera).—XI. *Australasian Species*. By CHARLES P. ALEXANDER, Ph.D., F.E.S., Urbana, Illinois, U.S.A.

THE species of crane-flies described in the present paper, like those in the two preceding instalments, are from New Zealand, and were included in very extensive series that were sent to me by my friends Messrs. Campbell, Harris, Howes, Lindsay, and Watt, to whom I am greatly indebted for this excellent representation of Tipulidæ.

*Dicranomyia nebulifera*, sp. n.

Size large (wing of ♀ 13 mm.); general coloration pale brown, the præscutum with three dark brown stripes; pleura variegated with dark brown; wings subhyaline, clouded with pale brown and grey; *Sc* short; cell 1st *M*<sub>2</sub> short, very wide distally; basal deflection of *Cu*<sub>1</sub> before the fork of *M*.

*Female*.—Length 11 mm.; wing 13 mm.

Described from an alcoholic specimen.

Rostrum brown, the palpi dark brown. Antennæ with the scapal segments dark brown; flagellum broken. Head dark brown.

Pronotum dark brown. Mesonotal præscutum obscure brownish yellow with three conspicuous dark brown stripes, the broad median stripe becoming obliterated before the suture; a faint brown cloud on the lateral margin opposite the anterior ends of the lateral stripes; scutum pale yellowish brown, the lobes darker; scutellum and postnotum pale

yellowish brown, the latter with the caudal half dark brown. Pleura obscure yellow, the propleura, a large area on the cephalic portion of the mesepisternum, the metapleura, and the lateral sclerites of the postnotum conspicuously dark brown; sternites dark brown, paler medially. Halteres pale, the knobs slightly infuscated. Legs with the coxæ obscure yellow, broadly infuscated except at tips; trochanters brownish yellow; remainder of legs broken. Wings large and broad, subhyaline, sparsely clouded with pale brown; a small darker brown spot at origin of *R*<sub>s</sub>; narrow pale brown seams at *r*, along the cord and outer end of cell 1st *M*<sub>2</sub>; a small, oval, brown spot at basal third of cell *M*; stigma very pale, oval; vague grey clouds in the outer radial and medial cells; along vein *Cu*<sub>2</sub>; before the end of cell *M*, extending into cell *Cu*; outer end of cell 1st *A*; the anal angle of the wing; veins dark brown. Venation: *Sc* short, ending immediately beyond the origin of *R*<sub>s</sub>; *R*<sub>s</sub> feebly angulate at origin, almost in alignment with *R*<sub>2+3</sub>; *r* at the tip of *R*<sub>1</sub>, much longer than the distal section of *R*<sub>1</sub>, angulated before mid-length, the section nearest *R*<sub>1</sub> with about eight macrotrichiae; cell 1st *M*<sub>2</sub> pentagonal, very wide at the distal end, *m* being about one-third the outer deflection of *M*<sub>3</sub>; basal deflection of *Cu*<sub>1</sub> about one-third its length before the fork of *M*, *Cu*<sub>2</sub> about one and one-half times the basal deflection of *Cu*<sub>1</sub>.

Abdomen dark brown, the genital segment and ovipositor much brighter brown. Valves of the ovipositor long and straight.

*Hab.* New Zealand.

*Holotype*, ♀, alcoholic, picked off engine on SS. 'Ngatoro,' trading to Chatham Islands; possibly from Lyttelton; November 12, 1921.

*Dicranomyia nephelodes*, sp. n.

General coloration dull brown, the præscutum with three confluent darker brown stripes; wings whitish subhyaline, the origin of *R*<sub>s</sub>, the cord, and outer end of cell 1st *M*<sub>2</sub> conspicuously clouded with dark brown; *Sc* short, *R*<sub>s</sub> long.

*Male*.—Length 7 mm.; wing 7·8–8·5 mm.

*Female*.—Length 6·5 mm.; wing 8 mm.

Rostrum and palpi dark brown. Antennæ dark brown throughout. Head dark brown, the front somewhat brighter.

Mesonotum dull brown, the usual stripes confluent, the lateral margins paler; scutum dull, the lobes dark brown;

scutellum and postnotum pale brown, sparsely pruinose. Pleura with a very heavy, microscopic, grey pubescence that appears like a pruinosity. Halteres pale, the knobs dark brown. Legs with the coxæ and trochanters obscure yellow; femora obscure brownish yellow, the tips dark brown; tibiæ and tarsi dark brownish black. Wings whitish subhyaline, heavily clouded with brown; a large brown spot at origin of *Rs*; stigma brown, the area connected with a large spot at the fork of *Rs*; a broad, conspicuous seam along the cord and outer end of cell 1st *M*<sub>2</sub>; a pale cloud along the entire length of vein *Cu*, beginning at arculus; veins pale brown, darker in the infuscated area. Venation: *Sc* short, *Sc*<sub>1</sub> ending just beyond the origin of *Rs*, *Sc*<sub>2</sub> a slightly greater distance before this origin; *Rs* long, arcuated, almost in alignment with *R*<sub>2+3</sub>; cell 1st *M*<sub>2</sub> pentagonal, longer than any of the veins beyond it; basal deflection of *Cu*<sub>1</sub> longer than or subequal to *Cu*<sub>2</sub>, at or before the fork of *M*.

Abdomen dark brown, the hypopygium fulvous; in some cases the abdomen is distinctly bicolorous, the caudal half of each segment being slightly darker brown than the basal half. Male hypopygium with the two spines on the rostrum of the ventral lobe long and powerful, straight, the distal spine a little shorter than the proximal spine, longer than the apex of the rostrum beyond them. Gonapophyses with the mesal angle produced caudad into a long digitiform lobe, directed caudad, the extreme apex a little laterad. Ovipositor with the valves slender.

*Hab.* New Zealand (North Island).

*Holotype*, ♂, Ohakune, altitude 2060 feet, October 27, 1921 (*T. R. Harris*).

*Allotopotype*, ♀, October 23, 1921.

*Paratopotypes*, 1 ♂, September 30, 1921; 1 ♂, October 14, 1921; 1 ♀, October 5, 1921.

Paratypes of *Dicranomyia nephelodes* were sent to Mr. Edwards for comparison with his types of *D. tenebrosa*, Edwards; he writes that the present species has a much heavier wing-pattern, the spot at the origin of *Rs* being far more conspicuous; *Rs* is longer and cells *M*<sub>1</sub> and 2nd *M*<sub>2</sub> are decidedly shorter. The present fly is distinguished from *D. hemimelas*, Alexander, by the dull coloration.

*Dicranomyia incompta*, sp. n.

General coloration grey; rostrum brownish black, about as long as the head; mesonotum dull yellowish grey with

three dark brown stripes; legs dark brown; wings subhyaline, the stigma oval, pale brown; *Sc* short, *Sc*<sub>2</sub> close to the tip of *Sc*<sub>1</sub>.

*Male*.—Length 6·5–6·8 mm.; wing 7–7·2 mm.

*Female*.—Length 7 mm.; wing 8 mm.

Rostrum as long as the head, brown, almost black dorsally, the palpi dark brownish black. Antennæ dark brown, the basal flagellar segments short-oval, the apical segments more elongate. Head brown, the vertex between the eyes more golden yellow.

Mesonotum yellowish grey, the præscutum with three conspicuous dark brown stripes; scutum grey, the lobes with relatively small brown marks; scutellum and postnotum grey. Pleura grey. Halteres with the stem yellow, the knobs darker. Legs with the coxæ and trochanters yellow; remainder of the legs dark brown, the bases of the femora paler. Wings subhyaline; stigma oval, pale brown; veins brown. Venation: *Sc* short, *Sc*<sub>1</sub> ending just before the origin of *Rs*, *Sc*<sub>2</sub> at tip of *Sc*<sub>1</sub>, *Rs* gently arcuated; cell 1st *M*<sub>2</sub> elongate, *m* less than one-half the outer deflection of *M*<sub>3</sub>; basal deflection of *Cu*<sub>1</sub> close to the fork of *M*, variable in position.

Abdomen dark brown, the sternites a little paler, the caudal margins of the segments indistinctly greyish. Male hypopygium with the mesal apical angle of the gonapophyses produced caudad into a short curved hook. Ovipositor with the valves long and straight.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Mt. Grey, Canterbury, altitude 1200–1500 feet, November 27, 1921 (*J. W. Campbell and Stuart Lindsay*).

“On undergrowth in beech forest.”

*Allotopotype*, ♀.

*Paratopotypes*, 9 ♂ ♀.

*Dicranomyia incompta* resembles the smaller *D. conulifera*, Edwards, but the flagellar segments are oval and the wings unmarked except for the pale stigma.

### *Dicranomyia funesta*, sp. n.

*Male*.—Length 5·6 mm.; wing 6·8 mm.

Related to *D. brookesi*, Edwards, from which it differs as follows:—

Head dark brown, including the genæ. Femora dark brownish black, the extreme tips obscure yellow, most evident on the inner face. Wings less distinctly tinged

with brown, the stigma darker. Venation:  $Sc_1$  shorter, a little more than one-half the basal deflection of  $R_{4+5}$ ;  $Rs$  shorter, about one-third longer than the basal deflection of  $Cu_1$ ; cell 1st  $M_2$  larger, about as long as vein  $Cu_1$  beyond it; vein 2nd  $A$  much straighter.

*Hab.* New Zealand (North Island).

*Holotype*, ♂, Wanganui, October 10, 1921 (*M. N. Watt*).

The type of *D. funesta* was submitted to Mr. Edwards for his expert opinion, and he agrees with the writer that it is an undescribed species. The obliteration of the subterminal yellow ring on the femur is a conspicuous character of this species.

*Dicranomyia annulifera*, sp. n.

*Male*.—Length 6.8 mm.; wing 8.1 mm.

*Female*.—Length 6.2 mm.; wing 7.5 mm.

Related to *D. brookesi*, Edwards, from which it differs as follows:—

Femora dark brown, the tips broadly but indistinctly obscure yellow, not with a subterminal ring as in *brookesi*. Wings with the cord and outer end of cell 1st  $M_2$  narrowly seamed with brown; origin of  $Rs$  unmarked. Venation:  $Sc_1$  very long, longer than the basal deflection of  $R_{4+5}$  and only a little shorter than  $Rs$ , ending opposite the origin of  $Rs$ . Abdominal segments conspicuously annulated obscure yellow and dark brown, the tergites with less than the basal half pale, the sternites with all but the narrow, dark brown posterior margin obscure yellow.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Mt. Grey, Canterbury, altitude 1200–1500 feet, November 27, 1921 (*J. W. Campbell and Stuart Lindsay*).

*Allotopotype*, ♀.

*Paratopotype*, ♂.

“On undergrowth in beech forest.”

*Dicranomyia annulifera*, *D. funesta*, sp. n., and *D. brookesi*, Edwards, form a natural group of closely allied species that are related to *D. vicarians*, Schiner, distinguished by the shiny coloration of the mesonotum, the shiny dark brown thoracic pleurites, and the presence of more or less yellow coloration on the femora.

*Amphineurus subfatuus*, sp. n.

Related to *A. fatuus* (Hutton); legs with the femora brownish black with faint indications of a broad yellow ring



near mid-length; wings with a conspicuous dark brown tinge, sparsely variegated with yellow, this including the wing-base and a narrow seam along the cord, the anal angle darkened.

*Female*.—Length about 6.2 mm.; wing 8 mm.

Rostrum and palpi dark brown. Antennæ with the scape dark brown, the flagellum paler brown, especially on the basal segments. Head dull greyish brown.

Mesonotum pale brown, the præscutum near the suture, the median area of the scutum and the base of the postnotum darker. Pleura conspicuously dark brown, the dorsal pleurites narrowly obscure yellow. Halteres with the stem brown, the extreme base pale yellow, the knobs obscure yellow. Legs with the coxæ brownish yellow, darker basally; remainder of the legs brownish black, the femoral bases narrowly obscure yellow; a very ill-defined yellowish ring near mid-length of the femora, best indicated on the fore femora. Wings with a conspicuous dark brown tinge, variegated with yellow, this including the bases of cells *R*, *M*, and *Cu*, the middle portions of cells 1st *A* and 2nd *A*; anal angle darkened; a narrow yellow band along the cephalic half of the cord, extending from costa to the fork of *M*; veins pale yellow in the flavous areas, darker elsewhere, much paler than in *A. fatuus*. Macrotrichiae more extensive than in *A. fatuus*, the yellow areas destitute of these setæ being more restricted. Venation: *Rs* shorter in *A. fatuus*; basal deflection of *Cu*<sub>1</sub> almost transverse in position, perpendicular to *Cu* at its origin, inserted at or just before the fork of *M*; petiole of cell *M*<sub>2</sub> longer than the basal deflection of *Cu*<sub>1</sub>.

Abdominal tergites obscure yellow, the caudal lateral angles of the segments broadly infuscated; pleural region dark brown.

*Hab.* New Zealand (North Island).

*Holotype*, ♀, Ohakune, altitude 2060 feet, November 13, 1921 (*T. R. Harris*).

*Paratopotype*, ♀, February 20, 1922 (*T. R. Harris*).

*Amphineurus campbelli*, sp. n.

General coloration brown; antennæ short; legs unicolorous; wings greyish subhyaline with conspicuous dark brown macrotrichiae; cell *R*<sub>2</sub> subsessile; cell 1st *M*<sub>2</sub> closed; male hypopygium with the pleurites very long and slender, the distal pleural appendages within the basal third of the

length; basal pleural appendage slender, the apex a strongly curved spine; gonapophyses strongly recurved.

*Male*.—Length about 5.5 mm.; wing 5.2 mm.

*Female*.—Length about 6 mm.; wing 6.8 mm.

Rostrum and palpi brown. Antennæ brown, relatively short in both sexes—in the male, if bent backward, extending about to the wing-root. Head dark brown with conspicuous white setæ.

Mesonotum brown, the humeral region of the præscutum obscure yellow. Pleura brown. Halteres yellow. Legs with the coxæ brown; trochanters obscure yellow; remainder of the legs brown, the terminal segments darker. Wings greyish subhyaline with abundant dark brown macrotrichia that almost conceal the ground-colour; veins pale brown. Venation: cell  $R_2$  almost sessile;  $R_{2+3}$  short to practically lacking; cell 1st  $M_2$  closed,  $m$  a little shorter than the outer deflection of  $M_1$ ; basal deflection of  $Cu_1$  just before the fork of  $M$ .

Abdomen dark brown, the caudal margins of the sternites paler. Male hypopygium with the pleurites exceedingly elongate, digitiform, the distal pleural appendages at less than one-third the length of the pleurites; basal pleural appendage slender, strongly curved into a black terminal spine; two distal pleural appendages, both strongly curved. Gonapophyses very strongly curved, the apical half lying parallel to the basal half, the slightly blackened point directed mesad, almost touching one another on the mid-line. Ovipositor with the elongate valves horn-coloured.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Mt. Grey, Canterbury, altitude 1200–1500 feet, November 27, 1921 (*J. W. Campbell and Stuart Lindsay*).

*Allotopotype*, ♀.

*Paratopotype*, ♂; *paratypes*, ♂ ♀, Lake Wakatipu, Otago, December 1921 (*F. S. Oliver*).

“On undergrowth in beech forest.”

*Amphineurus campbelli* is related to *A. perdecorus*, Edwards, and *A. senex*, Alexander, but is very distinct in the structure of the male hypopygium. It is named in honour of my friend, Dr. J. W. Campbell.

*Molophilus lindsayi*, sp. n.

General coloration dark brownish black; antennæ short; halteres yellow; wings pale brown; male hypopygium with

four slender elongate appendages, the terminal pair toothed near apex.

*Male*.—Length about 3.5 mm.; wing 5 mm.

Rostrum brown; palpi black. Antennæ short, black. Head brown, grey pruinose.

Pronotum brown, the scutellum obscure yellow. Mesonotum and pleura dark brown, sparsely pruinose. Halteres light yellow. Legs with the coxæ obscure yellow, the posterior coxæ more infuscated; trochanters obscure yellow; fore femora dark brown; mid-femora dark brown, the bases narrowly paler; posterior femora pale brown; tibiæ and tarsi brown. Wings pale brown, the veins slightly darker brown, the base a little paler; macrotrichiaë conspicuous. Venation: basal section of  $R_{2+3}$  about four times  $r$ ; basal deflection of  $Cu_1$  about one-half longer than the basal deflection of  $M_{1+2}$ ; vein 2nd  $A$  elongate, extending to about three-fourths the length of the petiole of cell  $M_3$ .

Abdomen dark brownish black with conspicuous golden-yellow setæ, longer and more conspicuous on the genital segment. Male hypopygium with four slender, elongate, black appendages, an apical pair that are strongly curved, before the long straight apex with a single small lateral spine; second pair of appendages are on the dorsal (apparent ventral) face and are directed cephalad, appearing as slender smooth spines, strongly bent at the base and less conspicuously so at the acute tips. Penis-guard small, pale yellow.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Mt. Grey, Canterbury, altitude 1200–1500 feet, November 27, 1921 (*J. W. Campbell and Stuart Lindsay*).

*Paratopotype*, ♂, altitude 2000 feet, March 19, 1922.

"On undergrowth in beech forest."

This interesting *Molophilus* is named in honour of the collector, who has secured many rare Tipulidæ on Mt. Grey.

*Rhabdomastix (Sacandaga) neozelandiæ*, sp. n.

Size large (wing of male over 5.5 mm.); general coloration dark brown, the thoracic pleura sparsely pruinose; wings with a strong brown suffusion;  $R_{2+3}$  about three-fourths the length of  $R_3$  alone.

*Male*.—Length about 5 mm.; wing 5.6–6 mm.

Rostrum and palpi dark brown. Antennæ short, dark brown; flagellar segments oval, the terminal segments more elongate. Head greyish brown. Mesonotal præscutum

dark brown, sparsely dusted with yellowish-brown pollen, clearer brown sublaterally; scutum and scutellum more pruinose. Pleura dark brown, sparsely pruinose. Halteres pale throughout. Legs with the coxæ brown; trochanters obscure yellow; femora and tibiæ brown, the tips a little darker; tarsi dark brown. Wings with a strong brown suffusion; wing-base narrowly paler; stigma brown, distinct but pale; veins dark brown. Venation:  $Sc_1$  ending about opposite three-fifths the length of  $R_s$ ,  $Sc_2$  barely indicated, about its own length from the tip of  $Sc_1$ ;  $R_{2+3}$  nearly three-fourths the length of  $R_3$ ; tip of  $R_2$  a little more than its own length from the tip of  $R_1$ ; cell 1st  $M_2$  irregularly oval, the inner end narrow;  $m$  variable in length, up to three or four times as long as the outer deflection of  $M_3$ ; basal deflection of  $Cu_1$  just beyond mid-length of cell 1st  $M_2$ ; vein 2nd  $A$  sinuous. Anal angle prominent.

Abdomen dark brown, the hypopygium obscure brownish yellow.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Waipori, Otago, December 5, 1921 (G. Howes).

*Allotype*, ♀, Lake Wakatipu, December 1921 (F. S. Oliver).

*Paratypes*, 2 ♂♂, Dunedin, Otago, November 26, 1921 (G. Howes).

The discovery of species of *Rhabdomastix* in New Zealand is of especial interest.

*Rhabdomastix (Sacandaga) otamana*, sp. n.

Size small (wing of male under 4.5 mm.); general coloration obscure yellow; wings with a faint greyish-yellow tinge;  $R_{2+3}$  about three-fifths the length of  $R_3$  alone.

*Male*.—Length 3.3 mm.; wing 4.2 mm.

Rostrum brownish yellow; palpi dark brown. Antennæ short; basal segment of scape brown; the remainder of the antenna dark brown; flagellar segments oval, attenuate apically, provided with long, outspreading, white verticils. Head pale brownish grey.

Mesonotum obscure yellow without markings. Pleura pale brownish yellow. Halteres short, obscure yellow. Legs with the coxæ and trochanters obscure yellow; legs brown. Wings with a faint greyish-yellow tinge; stigma pale, oval, barely indicated; veins pale brown. Venation:  $Sc_1$  ending beyond mid-length of  $R_s$ ,  $Sc_2$  faint, not far from the tip of  $Sc_1$ ;  $R_s$  long and straight,  $R_{2+3}$  about two-fifths

$R_3$ ; tip of  $R_2$  about its own length from the tip of  $R_1$ ;  $m$  long, about four times the outer deflection of  $M_3$ ; basal deflection of  $Cu_1$  near mid-length of cell 1st  $M_2$ ; vein 2nd  $A$  sinuous. Anal angle prominent.

Abdomen brownish yellow, the hypopygium concolorous.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Dunedin, Otago, December 14, 1921 (*G. Howes*).

*Limnophila hudsoni*, Edwards, *atripes*, subsp. n.

*Male*.—Length 12 mm.; wing 13 mm.

Differs from typical *hudsoni*, Edwards, as follows:—

Antennæ slightly longer, the flagellar segments much less conspicuously bicolorous, the extreme tips of the segments being pale, beyond mid-length of the organ passing into uniform black. Mesonotal præscutum clearer grey, the median stripe, the interspaces behind, and the lateral margins of the sclerite narrowly but distinctly lined with reddish brown. Femora brown, beyond the basal third passing into black, the extreme apices narrowly and indistinctly pale; a conspicuous subterminal yellow ring that is a little more extensive than the black ring beyond it; tibial apices distinctly blackened.

*Hab.* New Zealand (North Island).

*Holotype*, ♂, Ohakune, altitude 2060 feet, November 6, 1921 (*T. R. Harris*).

*Paratopotype*, ♂, November 14, 1921.

The general appearance of this fly is rather different from that of *L. hudsoni*, Edwards, due to the increase in the amount of black on the antennæ and legs, but there is no doubt of the close relationship of the two.

*Limnophila cinereipleura*, sp. n.

General coloration dark grey, the thoracic pleura clear ashen grey; wings greyish yellow, clearer yellow basally; stigma barely indicated; cell 2nd  $R_1$  at wing-margin a little wider than cell  $R_2$ ; cell  $M_1$  small.

*Male*.—Length about 4 mm.; wing 5 mm.

*Female*.—Length 5 mm.; wing 5.6 mm.

Rostrum, palpi, and antennæ black, the latter short in both sexes. Head brownish grey.

Mesonotal præscutum yellowish grey, clearer grey laterally, with three ill-defined brown stripes, the median stripe indistinctly split by a paler vitta; scutum dark grey; scutellum and postnotum light grey. Pleura with indications of a

ventral and dorsal dark longitudinal stripe enclosing a clear ashen-grey area. Halteres pale. Legs with the coxæ dark, dusted with grey; trochanters obscure yellow, margined apically with brown; remainder of the legs dark brown. Wings greyish yellow, clearer yellow basally, the stigmal area barely indicated; veins pale brown. Venation:  $Sc_1$  ending just before the end of  $R_s$ ,  $Sc_2$  a little more than its length from tip;  $R_s$  long, arcuated at extreme origin;  $R_{2+3}$  short, about equal to the basal deflection of  $R_{4+5}$ ;  $r$  faint, about three times its length from tip of  $R_1$ ; cell 2nd  $R_1$  a little wider at wing-margin than cell  $R_2$ ; cell 1st  $M_2$  small, rectangular; petiole of cell  $M_1$  very long, from one to two times the length of the cell; basal deflection of  $Cu_1$  at or just beyond the fork of  $M$ ; arculus complete.

Abdomen dark brown, including the hypopygium; each pleural appendage elongate, tapering to the acute point. Ovipositor with elongate valves, as in this group of species.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Mt. Grey, Canterbury, altitude 1200–1500 feet, November 27, 1921 (*J. W. Campbell and Stuart Lindsay*).

*Allotopotype*, ♀.

“On undergrowth in beech forest.”

*Limnophila truncata*, sp. n.

Mesonotum obscure yellow, scutal lobes and anterior half of postnotum brownish black; wings nearly hyaline with a brown spot at origin of  $R_s$  and seams along the cord and outer end of cell 1st  $M_2$ ;  $r$  near tip of  $R_1$ ; petiole of cell  $M_1$  short; basal deflection of  $Cu_1$  near mid-length of cell 1st  $M_2$ ; abdominal segments bicolorous; hypopygium compressed, obliquely truncated.

*Male*.—Length 5.5 mm.; wing 7.2 mm.

Rostrum yellow, palpi brownish black. Antennæ short; basal segment of scape obscure yellow; remainder of antenna brownish black; flagellar segments elongate-oval with short verticils. Anterior part of vertex brownish yellow, the remainder of head brownish grey.

Mesonotal præscutum brownish yellow with three clearer yellow stripes that are very ill-defined; median stripe split by a capillary dark brown line that becomes obliterated before the suture; scutum obscure brownish yellow, the lobes conspicuously dark brown; scutellum pale brownish testaceous; postnotum brownish black on the cephalic half, the posterior half pale brown. Pleura brownish yellow

testaceous. Halteres elongate, pale brown, the knobs dark brown. Legs with the coxæ and trochanters yellowish testaceous; femora dark brown, the bases broadly paler, most extensively on the fore legs where more than the basal half is pale, least extensively on the posterior legs where less than the basal third is pale; tibiæ and tarsi black. Wings nearly hyaline, with a sparse brown pattern; stigma oval, dark brown; a brown spot of origin of  $R_s$ ; a brown seam along the cord, beginning at  $Sc_2$ , continued across the fork of  $R_{2+3}$  to the basal deflection of  $Cu_1$ ; a brown seam along the outer end of cell 1st  $M_2$ . Venation:  $Sc_2$  considerably longer than  $Sc_1$ , just beyond the fork of  $R_{2+3}$ ;  $R_s$  long, arcuated at origin;  $R_{2+3}$  about one-half longer than the basal deflection of  $Cu_1$ ;  $r$  about one and one-half its length from the tip of  $R_1$  and on  $R_2$  beyond mid-length; cells  $R_3$ ,  $R_6$ , and 1st  $M_2$  in alignment; cell  $M_1$  deep, its petiole about equal to  $R_{2+3}$ ;  $m$  shorter than outer deflection of  $M_3$ ; basal deflection of  $Cu_1$  at or just before mid-length of the caudal face of cell 1st  $M_2$ ; cell 2nd  $A$  long and narrow; anterior arcus atrophied. Wings petiolate.

Abdominal tergites dark brown, the basal half of tergite 2 pale; tergites 2 to 7 conspicuously ringed caudally with pale yellow; tergites 8 and 9 dark brown; sternites obscure yellow, less than the basal half of each segment infuscated. Hypopygium compressed, viewed laterally appearing obliquely truncated.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Mt. Grey, Canterbury, altitude 1200–1500 feet, November 27, 1921 (J. W. Campbell and Stuart Lindsay).

“On undergrowth in beech forest.”

*Limnophila (Metalimnophila) unipuncta*, sp. n.

Allied to *L. producta*, Alexander; wings with a faint brown tinge; stigma brown; a narrow brown seam along  $r-m$ ; male hypopygium with the mesal apical angle of each pleurite produced into a stout lobe that is nearly as long as the pleurite itself; outer pleural appendage simple; inner pleural appendage strongly bent at mid-length.

*Male*.—Length about 5 mm.; wing 6 mm.

Rostrum and palpi black. Antennæ elongate, black. Head dark brown.

Mesonotal præscutum light brown with three darker brown stripes; scutum pale brown, the centre of the lobes dark brown; scutellum and postnotum brownish grey.

Pleura silvery grey, the pleural stripe very broad, brownish black; sides of mesosternum faintly darkened. Halteres brown, the base of stem and apex of knob pale. Wings with a faint brown tinge; stigma elongate, brown; a narrow but conspicuous dark brown seam on  $r-m$  and the basal deflection of  $R_{4+5}$ ; veins dark brown. Venation:  $Sc_2$  near tip of  $Sc_1$  and about twice the length of the latter; petiole of cell  $M_1$  one-half longer than the cell.

Abdomen dark brown, the caudal margins of the basal segments very faintly paler. Male hypopygium with the ninth tergite having two slender parallel lobes. Mesal face of pleurite produced into a very large flattened lobe, the mesal apical angle produced into a second lobe that is nearly as long as the pleurite but stout, broad at base, gradually narrowed to the blunt apex, this lobe much longer than in *L. howesi*, but shorter than in *L. producta*; outer pleural appendage a long, curved, simple blade, bearing long setæ on the outer face before the apex; inner pleural appendage slender, very strongly arcuated at mid-length. Spines of the eighth sternite arising from a pedunculate base.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Dunedin, Otago, November 26, 1921 (*G. Howes*).

*Paratype*, ♂, Ben Lomond, Otago, December 30, 1921 (*G. Howes*).

*Macromastix pallidistigma*, sp. n.

Mesonotum uniformly reddish brown, unmarked; wings pale greyish; cells  $C$  and  $Sc$  brown; stigma large, pale cream-yellow; petiole of cell  $M_1$  longer than  $m$ ; cell 2nd  $A$  long and narrow; abdomen pale greenish brown; ninth tergite of male hypopygium with a broad, U-shaped, median notch, the lobes short, obtusely rounded.

*Male*.—Length 9 mm.; wing 11.5 mm.

Frontal prolongation of the head long, pale, sparsely pruinose, the nasus long and broad. Antennæ very small; first scapal segment pale, second segment pale green; flagellum brown, the basal segments tinged with green, the terminal segments uniformly dark. Head pale brown, sparsely dusted with grey.

Pronotum tinged with green. Mesonotal præscutum uniformly reddish brown, unmarked; scutum similar, the lateral margins of the lobes dark; scutellum and postnotum a little paler, especially the former. Pleura obscure yellow. Halteres tinged with green. Legs with the coxæ concolorous



with the pleura; trochanters green; femora obscure yellow, the bases and tips narrowly tinged with green; tibiae and tarsi pale brown. Wings with a pale greyish tinge, cells *C* and *Sc* dark brown, the former a little paler; stigmal area large, pale cream-yellow; wing-base indistinctly pale; veins slender, dark brown. Venation: *Sc*<sub>2</sub> ending about opposite mid-length of *Rs*, the latter straight, about two-thirds *R*<sub>2+3</sub>; *r* faint, with one macrotrichia near mid-length; distal section of *R*<sub>2</sub> pale but evident, nearly as long as *m*; petiole of cell *M*<sub>1</sub> a little longer than *m*; inner end of cell 1st *M*<sub>2</sub> pointed; cell 2nd *A* very long and narrow, parallel-sided.

Abdomen pale greenish brown, the eighth sternite indistinctly darker; hypopygium obscure greenish. Male hypopygium with the ninth tergite having a broad, U-shaped, median notch, the short lobes obtusely rounded. Region of the ninth pleurite not produced beyond the level of the end of the tergite as in *M. albistigma*, Edwards.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, White Rock, Mt. Thomas, Canterbury, altitude 1000 feet, December 18, 1921 (*J. W. Campbell and Stuart Lindsay*).

*Paratopotype*, ♂.

*Macromastix pallidistigma* is by far the smallest species of the *viridis* group so far described. The second cell is very narrow for a member of this group.

*Macromastix greyana*, sp. n.

*Male*.—Length 11–12 mm.; wing 17–17.2 mm.

Related to *M. alexanderi*, Edwards, from which it differs as follows:—

Size a little larger. Frontal prolongation of head elongate, the nasus long and conspicuous. Head pale buff with a relatively small dark brown spot in the centre of the vertex. Thorax clear light grey, the præscutum with four conspicuous dark brown stripes, the intermediate pair narrowly separated by a capillary line; lateral margins of præscutum not darkened; each scutal lobe with a conspicuous dark brown area; median area of scutum, the scutellum, and postnotum pale testaceous, the caudal margin of the latter a little darkened. Pleura clear light grey. Wings relatively narrow, the pattern much darker brown; cells *M*<sub>1</sub> and 2nd *M*<sub>2</sub> clear except the extreme bases which are abruptly dark; basal half of cell *M*<sub>3</sub> clear, the apex with a dusky triangle; no conspicuous brown blotch in cell *M* on vein *Cu*

just before its fork, so the large clear blotch in cell *M* is constricted only on its cephalic side; bases of cells 1st *A* and 2nd *A* more extensively pale. Venation: basal section of *R*<sub>2</sub> short, in some cases almost lacking; *r* joining *R*<sub>2</sub> close beyond the fork of *R*<sub>2+3</sub>; basal deflection of *R*<sub>4+5</sub> short, less than twice *r-m*; basal sections of *M*<sub>1+2</sub> and *M*<sub>3+4</sub> subequal; petiole of cell *M*<sub>1</sub> only a little longer than *m*. Abdomen dark brownish grey, very slightly darker dorso-medially, the basal tergites broadly ochreous on the sides; basal sternites a little more brownish than sternites 6 to 8.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Mt. Grey, Canterbury, altitude about 1000 feet, November 27, 1921 (*J. W. Campbell and Stuart Lindsay*).

*Paratopotype*, 1 ♂; *paratypes*, 1 ♂, White Rock, Mt. Thomas, Canterbury, altitude about 1000 feet, December 18, 1921 (*J. W. Campbell and Stuart Lindsay*); 9 ♂♂, Glentui, Ashley Co., Canterbury, December 1921 (*Stuart Lindsay*).

"Swept from tussock grass on hill-side."

*Macromastix greyana* is distinguished from *M. huttoni*, Edwards, by the coloration of the wings, thorax, and abdomen.

### *Macromastix rufibasis*, sp. n.

Related to *M. rufiventris*, Edwards; mesonotal præscutum with three black stripes; wings uniformly infuscated, the pale discal blotch larger and better delimited; abdominal tergites 1 and 2 with the lateral margins rufous-orange.

*Male*.—Length about 9.5 mm.; wing 13.2 mm.

Differs from *M. rufiventris* as follows:—

Mesonotal præscutum light grey with three conspicuous black stripes, the median stripe entire, broadly cuneiform; scutellum and postnotum light ashy grey. Wings with the dark suffusion more uniform, the pale discal blotch at the cord larger and better defined, including the outer end of cell *R*, the basal third of cell 1st *M*<sub>2</sub> and a small area in cell *M*; in addition, the centre of cell *M*, the bases of cells *Cu*, 1st *A*, and 2nd *A*, and the prearcular cells are less distinctly pale; no clear obliterative area before stigma. Venation: petiole of cell *M*<sub>1</sub> about two-thirds *m*; basal section of *M*<sub>3</sub> only a little shorter than the basal section of *M*<sub>1+2</sub>; cell 2nd *A* wider. Abdominal tergites with the rufous-orange colour confined to segments 1 and 2; segment 1 rather broadly infuscated medially; segment 2 narrowly infuscated

on the basal ring, very broadly so on the posterior ring, the lateral margins here being obscure orange; lateral margins of the remaining tergites broadly cinereous; the very broad dark brown median stripe on tergites 3 to 9 is split by a conspicuous grey line that becomes more diffuse on the posterior segments; sternites with the basal segments obscure brownish yellow, soon passing into grey.

*Hab.* New Zealand (South Island).

*Holotype*, ♂; Dunedin, Otago, November 20, 1921 (*M. N. Watt*).

"Beaten from foliage."

*Macromastix harrisi*, sp. n.

General coloration pale brown; wings subhyaline, the stigma pale brown; *r* lacking; cell 1st *M*<sub>2</sub> rectangularly quadrate; basal deflection of *Cu*<sub>1</sub> some distance before the fork of *M* as in the genus *Nephrotoma*.

*Female*.—Length about 7.5 mm.; wing 11.5 mm.

Frontal prolongation of the head pale testaceous; nasus obsolete; palpi pale brown. Antennæ short, pale brown, the terminal segments darker; first flagellar segment long and tumid. Head dark, especially on the vertex, with a pale greyish-yellow pollen on the front and adjoining the margin of the eyes; a very narrow brown median vitta on vertex.

Mesonotum pale brown, the median stripe darker but ill-defined; remainder of mesonotum pale reddish brown; an indistinct brown spot at each anterior lateral angle of the postnotum. Pleura pale reddish yellow. Halteres brown, the base of the stem and the knobs obscure yellow. Legs with the coxæ and trochanters concolorous with the pleura; remainder of the legs darker brown. Wings subhyaline; stigma pale brown, entirely proximal of *R*<sub>2</sub>; veins pale brown. Venation: *Sc*<sub>1</sub> preserved; *Rs* relatively short, arcuated; *R*<sub>2</sub> close to *R*<sub>1</sub> at the wing-margin, the distance about equal to *Sc*<sub>1</sub>; *r* lacking; petiole of cell *M*<sub>1</sub> about equal to *m*; cell 1st *M*<sub>2</sub> quadrangular; *m-cu* punctiform, some distance before the fork of *M*, the distal section of *M* equal to or longer than the basal deflection of *R*<sub>4+5</sub>; cell 2nd *A* broad.

Abdomen brown, distended and discoloured with egg-masses.

*Hab.* New Zealand (North Island).

*Holotype*, ♀, Ohakune, altitude 2060 feet, November 13, 1921 (*T. R. Harris*).

The type is rather teneral. *Macromastix harrisi* is dedicated to the collector, Mr. T. R. Harris, to whom I am greatly indebted for many fine Tipulidæ from New Zealand. It is allied to *M. atridorsum*, Alexander, but differs from this species, as well as all others so far described, by the position of the basal deflection of  $Cu_1$ , which is basad of the fork of *M* as in the genus *Nephrotoma*.

VI.—*On a Collection of Mammals obtained by Capt. G. C. Shortridge in Northern Rhodesia, with Field-notes by the Collector.* By P. S. KERSHAW.

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THE following is a list of the small mammals obtained by Capt. G. C. Shortridge in 1919 and 1920 in Northern Rhodesia. The bulk of the collection was secured during the construction of the aerodrome at N'dola, near the Belgian Congo frontier, at 12° 50' S., 28° 40' E. The remainder, with one or two exceptions, came from Monze, 200 miles south of N'dola. Many specimens of the genera *Nasitio*, *Crocidura*, *Taterona*, *Steatomys*, *Saccostomus*, *Acomys*, *Leggada*, *Zelotomys*, and *Cricetomys* were captured during the levelling of the numerous large ant-hills on the aerodrome.

Three new species from this collection have already been described by Hinton\*. These were *Mimetillus thomasi*, *Kerivoula lucia*, and *Zelotomys shortridgei*. On a further examination of the material it has been found necessary to give names to the following forms:—*Crocidura katharina*, *Helogale brunnula ruficeps*, and *Taterona lobengulæ ndolæ*.

This opportunity has been taken to describe a new form of *Acomys*—viz., *A. sabryi*—from Helouan, near Cairo, the type and other specimens of which have been kindly presented to the British Museum by the Giza Zoological Museum.

There is also appended a list of the Ungulates obtained in various localities in Northern Rhodesia, and presented to the British Museum by Mr. D. Gordon Lancaster, Mr. and Mrs. Gordon Read, Mr. E. R. D. Hall, Capt. G. C. Shortridge, Mr. H. Wainwright, and Dr. J. Harmer, donations which I have much pleasure, on behalf of the Trustees, in acknowledging.

\* Ann. & Mag. Nat. Hist. (9) vi. p. 239 (1920).

1. *Cercopithecus pygerythrus whytei*, Poc.

211, 213; ♂. 123; ♀. 18, 169, 442. N'dola.

No. 123 has grey instead of black hands and feet. The brightness of the yellow on the back varies, and is evidently an individual character. For this reason I think that *C. silaceus*, Elliot, should become a synonym of *C. p. whytei*. In these specimens there is every shade of gradation between the colours of the two types.

2. *Papio* sp.

♂. 310; ♀. 56. N'dola.

3. *Galago crassicaudatus monteiri*, Gray.

♂. 62, 291; ♀. 64, 96. N'dola.

Native name "musati."

4. *Galago moholi*, A. Smith.

♂. 58, 72, 73, 77, 78, 97, 119, 126, 131, 133, 135, 137, 138, 154, 166; ♀. 71, 76, 121, 122, 129, 132, 155, 165, 234. N'dola.

"Exceedingly plentiful. They have extraordinary leaping powers, that are curiously frog-like. Like the slender loris of India they are able to creep through very small apertures. They do not appear to be very timid when handled."

5. *Epomophorus wahlbergi*, Sund.

♀. 424. N'dola.

6. *Epomophorus crypturus*, Pet.

♂. 328. N'dola.

7. *Nycteris capensis*, A. Smith.

♂. 7, 8, 9, 10, 13, 21; ♀. 12, 14, 15, 16, 19, 22, 24, 25, 26, 27, 28. Monze.

8. *Lavia frons*, Geoff.

♂. 17, 29; ♀. 1. N'dola.

9. *Pipistrellus nanus*, Pet.

♂. 277, 357; ♀. 41. N'dola.

10. *Mimetillus thomasi*, Hint.

♀ . 481 (type-specimen). N'dola.

11. *Kerivoula argentata*, Tomes.

♂ . 415, 417; ♀ . 414, 416. N'dola.

Hitherto the type, a ♀ from Otjoro, Damaraland, S.W. Africa (R. E. Tomes, P. Z. S. 1861, p. 32), has been the only specimen in the collection. The specimens collected by Mr. Shortridge appear to be quite indistinguishable, notwithstanding the great difference of locality.

12. *Kerivoula lucia*, Hint.

♂ . 472 (type-specimen). N'dola.

"Bats of this genus are not gregarious, and never roost together in numbers. I have never met with any species of the genus that can be considered plentiful."

13. *Nasilio brachyrhynchus*, A. Smith.

♂ . 26, 43, 52, 229, 238, 345, 348, 368, 408, 410, 411, 412, 427, 430, 432, 435, 436, 438; ♀ . 30, 250, 312, 330, 331, 393, 404, 405, 421, 425, 426, 433, 435. N'dola.

"Partly, if not entirely, diurnal. Elephant-shrews never attempt to bite when handled. If kept with even small rodents they almost invariably get killed. This species, in addition to being caught in numbers during the levelling of ant-hills, was occasionally seen hopping across footpaths by day. Unlike the South-African elephant-shrews, this animal inhabits thick forest."

14. *Pachyura liza*, Thos.

♂ . 311; ♀ . 237. N'dola.

15. *Crocidura hirta*, Pet.

♂ . 230, 263, 306, 364; ♀ . 102, 261, 288, 297. N'dola.

16. *Crocidura katharina*, sp. n.

♂ . 217; ♀ . 81, 227. N'dola.

A small light-coloured shrew of the *jacksoni* group.

General colour of dorsal surface "drab-grey" washed with "écru drab"; ventral surface silvery grey. The colour of

the ventral surface extends up the sides well above the lateral gland (in the type-specimen about 4 mm. above it). Hands and feet white. Tail brown above, light below, short, and clothed with numerous long white bristle-hairs to the tip.

Skull smaller and more flattened than in *jacksoni*, the rostrum shorter, but with a greater maxillary breadth.

*Type.* Adult male. B.M. no. 20. 11. 3. 53. Original number 217. Collected on June 12th, 1919, by Capt. G. C. Shortridge.

*Type-locality.* N'dola, North Rhodesia, 12° 50' S., 28° 40' E.

Dimensions of the type:—

Head and body 68 mm.; tail 41; hind foot 11; ear 9.

*Skull:* condylo-incisive length 20; breadth of brain-case 9; greatest maxillary breadth 7.1; palatilar length 7.8; length of upper tooth-row (base of incisor to back of last molar) 8.1.

The outstanding characteristics of this species are its very light colour and the great extension of the grey of the ventral surface up the sides. Perhaps the nearest approach to it in colour in the genus is shown by *C. boydi* from the Welle River, a larger species.

The resemblance externally of this species to *Pachyura lixa* is very striking, and is an excellent example of isomorphism. Without the skull to decide the point, it would not occur to a casual observer that these were not the same species.

#### 17. *Felis pardus*, Linn.

♂. 1. N'dola.

#### 18. *Felis serval*, Schreb.

489. N'dola.

#### 19. *Felis* sp.

400 (juv.). N'dola.

#### 20. *Civettictis civetta*, Schreb.

♂. 207. N'dola.

#### 21. *Genetta* sp.

208, 440. N'dola.

#### 22. *Herpestes gracilis cauxi*, A. Smith.

♂. 63, 204, 504; ♀. 2. N'dola.

23. *Helogale varia*, Thos.

♂. 79. N'dola.

24. *Helogale brunnula ruficeps*, subsp. n.

♂. 110; ♀. 109–111. Monze.

A russet-headed local form of *H. brunnula*, Thos. & Schwann.

Colour of back and tail "Prout's brown," not so rich as in *H. brunnula*. Throat, sides of head and neck, and ears russet; crest rather darker. The russet colour of the head merges into the colour of the back before reaching the shoulders. Under surface a lighter brown than in *H. brunnula*, and more in contrast with the colour of the back. Tail without the dark terminal pencil of *H. brunnula*. The russet colour reappears in the hands and feet.

Dimensions of the type (measured in the flesh):—

Head and body 211 mm.; tail 160; hind foot 45; ear 16.

*Type-locality*. Monze, 200 miles south of N'dola, N.W. Rhodesia.

*Type*. Adult male. B.M. no. 21.8.11.4. Original number 110. Collected by Mr. Powell.

This is a well-marked subspecies. The three specimens to hand, all from the type-locality, are precisely similar in colour.

25. *Mungos mungo*, Gmel.

= *Crossarchus fuscatus*, Desm.

♀. 23. N'dola.

26. *Canis* sp.

♀. 488. N'dola.

27. *Mellivora* sp.

287. N'dola.

28. *Ictonyx striatus*, Perry.

441. N'dola.

29. *Heliosciurus rhodesiae*, Wrought.

♂. 22, 106, 254, 318; ♀. 55, 153, 253, 418. N'dola.



"Fairly plentiful around N'dola. This species appeared to be rather less of a forest animal than *Paraxerus cepapi*, being frequently observed around trees that were growing in the gardens."

30. *Paraxerus cepapi quatus*, Wrought.

♂. 24, 38, 406; ♀. 10, 407, 423. N'dola.

31. *Paraxerus cepapi sindi*, Thos. & Wrought.

♂. 36, 37, 69; ♀. 31, 38, 56. Monze.

A large amount of material has been received by the British Museum since the various geographical races of *P. cepapi* were established. The difference between the forms is not great, and there are many areas of intergradation. There seems no doubt that *P. c. soccatus*, Wrought., from N. Angoniland should merge in *P. yulei*, Thos.

The material to hand suggests the following areas of distribution:—

*P. cepapi*, A. Smith.—Typical locality: "the banks of the Marikwa River." Range: from the Upper Limpopo to Natal.

*P. c. sindi*, Thos. & Wrought.—Typical locality: Tette, on the Zambesi. Range: Lake Ngami, the Kafue, Zambesi, and Shiré Rivers.

*P. c. yulei*, Thos. (= *P. c. soccatus*, Wrought.).—Typical locality: Muczo, near Lake Mweru. Range: from Lake Mweru, eastward to the Tanganyika-Nyasa Plateau, and southward to Angoniland.

*P. c. quatus*, Wrought.—Typical locality: Katanga Dist., Congo State. The actual locality given on the type-specimen is "near the Dikulwe River, Katanga." Range: Katanga eastward to the Loangwa Valley.

The Loangwa Valley seems to be an area of intergradation between *P. c. quatus* and *P. c. sindi*.

The key given by Wroughton (Ann. & Mag. Nat. Hist. (8) iii. p. 516, June 1909) may be rearranged as follows:—

- |   |                       |
|---|-----------------------|
| A. Flanks and thighs strongly suffused with orange-buff.                |                       |
| a. Belly clay-colour .....  | <i>P. cepapi</i> .    |
| b. Belly white .....  | <i>P. c. sindi</i> .  |
| B. Flanks and thighs not, or only slightly, suffused with orange-buff.  |                       |
| a. Shoulder-patches red. Feet buffy .....                               | <i>P. c. quatus</i> . |
| b. Shoulder-patches absent or inconspicuous. Feet grey or greyish ..... | <i>P. c. yulei</i> .  |

32. *Graphiurus microtis*, Noack.

♂. 308, 315, 354, 374, 377, 378, 388, 390, 396; ♀. 37, 168, 214, 215, 218, 225, 246, 258, 267, 293, 295, 304, 309, 340, 347, 367, 369, 370, 371, 379, 380, 384, 385, 387. N'dola.

♀. 30. Monze.

33. *Graphiurus* sp.

♀. 269, 270, 271, 355, 389. N'dola.

34. *Taterona nyasæ*, Wrought.

359. Loangwa Valley, N. Rhodesia.

35. *Taterona lobengulæ*, de Wint.

♂. 42, 44, 80, 94; ♀. 32, 33, 96. Monze.

36. *Taterona lobengulæ ndolæ*, subsp. n.

♂. 158, 159, 175, 255, 275, 316, 317, 321, 322, 338, 362; ♀. 157, 162, 189, 265, 274, 276, 326, 327, 365. N'dola.

A local form of *T. lobengulæ*, de Wint., with a small hind foot.

Darker than the typical form and than *T. l. griquæ* and *T. l. bechuanæ*, but not quite so dark as, and less rufous in colour than, *T. l. mashonæ*. Incisors with well-marked grooves.

*Type*. Adult female. B.M. no. 20. 11. 3. 143. Original number 189. Collected on 8th June, 1919, by Capt. G. C. Shortridge.

*Type-locality*. N'dola, N. Rhodesia, 12° 50' S., 28° 40' E.

There are specimens in the British Museum Collection from the Katanga District, Belgian Congo, which may be referred to this form.

Dimensions of the type:—

Head and body 142 mm.; tail 180; hind foot 32; ear 21.

*Skull*: greatest length 40; condylo-incisive length 37.5; bullæ 10.5; distance between anterior and posterior palatal foramina 4.

The average measurements of twelve adult specimens are:—

Head and body 131 mm.; tail 151; hind foot 31.7; ear 20.

The whole series is very uniform in colour. Specimens from the country between Lake Bangweolo and the River Lualaba differ not at all from the N'dola animals.

37. *Taterona liodon*, Thos.

♂. 91, 93, 94, 150, 251; ♀. 90, 92, 130, 160, 252, 302. N'dola.

A comparison of the type-specimen of *T. neavei*, Wrought.\*, with these specimens leaves no room for doubt that *T. neavei* is an immature *T. liodon*.

38. *Taterona (Gerbilliscus) boehmi*, Noack.

♂. 88, 148, 149, 299; ♀. 103, 140, 298. N'dola.

39. *Dendromus jamesoni*, Wrought.

♂. 366, 401; ♀. 394, 431. N'dola.

I cannot detect any points of difference between nos. 366 and 401 and the *Dendromus* from the N.E. Transvaal. In the other two specimens the dorsal stripe is more or less obsolescent.

40. *Dendromus (Poemys) nigrifrons*, True.

♂. 74, 99, 101, 170; ♀. 89, 95, 100, 104. N'dola.

The type-locality of this species is Kilimanjaro, and the range seems to be very extensive. South of the Zambesi it is replaced by *D. n. volturnus*, Thos.

41. *Steatomys pratensis*, Pet.

♂. 84, 98, 116, 117, 118, 143, 144, 185, 188; ♀. 31, 75, 82, 85, 87, 141, 142, 145. N'dola.

♂. 34, 66, 67, 74, 76, 78, 84, 87, 88, 95, 98, 99, 100, 101, 106, 107; ♀. 46, 77, 79, 85, 86, 89. Monze.

42. *Rattus rattus alexandrinus*, Geoff.

♂. 3, 9, 403, 485; ♀. 219, 220, 221, 222, 223, 484. N'dola.

43. *Rattus rattus frugivorus*, Raf.

♂. 20, 482; ♀. 5, 7, 8, 483. N'dola.

\* Mem. & Proc. Manchester Lit. & Phil. Soc. vol. li. (1907), no. 5, p. 18.

44. *Rattus (Æthomys) walambæ*, Wrought.

♂. 124, 244, 264, 325, 479; ♀. 59, 61, 125, 139, 245, 280. N'dola.

45. *Rattus (Mastomys) coucha microdon*, Pet.

♂. 42, 45, 67, 174, 196, 198, 199, 201, 203, 216, 228, 242, 257, 273, 319, 402, 475; ♀. 46, 193, 197, 272, 282, 289, 350, 351, 352, 353, 420, 477. N'dola.

♂. 3, 5, 17, 35, 39, 46, 53, 58, 62, 81, 97, 102; ♀. 6, 11, 18, 41, 45, 48, 55, 57, 59, 63, 64, 65, 71, 72, 73, 83, 90, 91, 92, 93, 104, 105. Monze.

46. *Leggada bella marica*, Thos.

♂. 34, 172, 173, 232, 283, 284, 286, 320, 346, 429, 480; ♀. 15, 33, 231, 247, 329, 419, 502. N'dola.

47. *Zelotomys shortridgei*, Hint.

♂. 47, 301, 392; ♀. 48, 248, 336 (type-specimen). N'dola.

48. *Cricetomys gambianus viator*, Thos.

♂. 474; ♀. 305, 490. N'dola.

These do not appear to differ from the Nyasaland form.

49. *Saccostomus campestris*, Pet.

♂. 109, 110, 111, 113, 161, 176; ♀. 69, 114, 182. N'dola.

50. *Acomys selousi*, de Wint.

♂. 235, 294, 324, 333; ♀. 332, 372. N'dola.

I have compared these with the type-specimen of the species, with which they agree in every particular. The type-locality—Essex Vale, near Bulawayo—is 500 miles away. The species appears to be widely spread. It occurs all over Rhodesia.

The description of the new spiny mouse from Lower Egypt above referred to is as follows:—

*Acomys sabryi*, sp. n.

Size as in *A. cahirinus*, but in colour widely different.

Smoky brown on the crest and down the back, drab on the sides, and pure white below. A spot of white at the base of the ear and a ring of white hairs at the back of the ear. Feet white. Tail rather longer than head and body, brown above, white below.

Skull very much as in *A. cahirinus*, and differs from *A. witherbyi*, de Wint., of the Sudan, by having a longer, narrower rostrum and less heavy molar teeth.

*Type-locality.* Helwan, 10 miles south of Cairo. There are other specimens in the British Museum Collection from Giza Zoological Gardens.

*Type.* Adult female. B.M. no. 22. 3. 15. 8. Original number 4. Collected by Mahmoud Effendi Sabry on 16th May, 1921, and presented to the British Museum by the Giza Zoological Museum.

Dimensions of the type (measured in the skin):—

Head and body 126 mm.; tail (mutilated); hind foot 18·5; ear 18.

*Skull:* greatest length 29·4; condylo-incisive length 26·6; breadth of brain-case 12·7; length of nasals 11·0; greatest breadth of nasals (about the centre) 2·4.

The following measurements of some younger specimens show the relative lengths of body and tail:—

	No. 2, ♀. mm.	No. 5, ♂. mm.	No. 6, ♀. mm.	No. 7, ♀. mm.
Head and body ....	82	102	95	92
Tail .....	83	105	95	112

*A. sabryi* is undoubtedly connected with *A. cahirinus*, as the cranial characters and the measurements prove. The difference in colour may well be due to environment. One specimen, B.M. no. 22. 3. 15. 6, shows a distinct approximation to the sooty colour of *A. cahirinus*. It is, perhaps, better to treat *A. sabryi*—for the present, at any rate—as a full species until its affinities with other species have been established. Heuglin's account of *A. nubicus* is too meagre to be of any value. He gives as the type-locality "Nubia along the Nile," and the dimensions as: head and body 111 mm., tail 118. He then merely adds that it is larger and a paler brown than *A. cinerascens*. Specimens of *Acomys* in the British Museum Collection from Merowe in Nubia are remarkably like *A. sabryi* both in skull and colour. On the other hand, a specimen from Kerma, at the third cataract, is much more like *A. witherbyi*. At present there is no material available for comparison in the British Museum

from the Nile Valley between Helwan and Kerma, a distance of 800 miles. It will probably be found, however, that Heuglin's name will have to be dropped on grounds of uncertainty.

*A. dimidiatus*, Cretzschm., from Sinai and Arabia, is a larger, lighter-coloured animal, with a very long tail.

*A. russatus aegyptiacus*, Bonh., from the Wadi Hof, near Helwan, is a bright orange-coloured species.

This species is named after Mahmoud Effendi Sabry, in the employment of the Egyptian Zoological Service, who took a great deal of trouble in collecting the specimens.

51. *Dasymys incomtus*, Sund.

446. Imbo Junction, Luapula River, N. Rhodesia.

Collected by Mr. E. R. D. Hall.

52. *Cryptomys mellandi*, Thos.

♂. 12, 13, 14, 21, 36, 54, 57, 147, 164, 260, 266, 476 ;  
♀. 32, 35, 39, 40, 51, 53, 236. N'dola.

53. *Cryptomys whytei*, Thos.

358. Loangwa Valley.

54. *Lepus* sp.

♂. 473 ; ♀. 19, 163, 503. N'dola.

All young specimens.

55. *Alcelaphus lichtensteini*, Pet.

♂. 462. Kalomo, N. Rhodesia.

♂. 461. Namwala, N. Rhodesia.

56. *Damaliscus* sp.

♂. 507. N. Rhodesia.

57. *Connochates taurinus*, Burch.

♀. 464. Kalomo.

♂. 465. Namwala.

58. *Cephalophus sylvicultrix*, Afz.

♂. 205, 206. N'dola.

59. *Cephalophus grimmi*, Linn.

♀. 489. N'dola.

60. *Oreotragus oreotragus*, Zimm.

428. Fort Jameson.

61. *Ourebia ourebi*, Zimm.

♂. 289, 307, 310. Kalomo.

62. *Raphiceros sharpei*, Thos.

♂. 356. N'dola.

63. *Redunca arundinum*, Bodd.

♂. 471. Magoye.

64. *Kobus ellipsiprymnus*, Og.

♂. 460. Magoye.

♂. 451. Chambisti Stream.

65. *Kobus (Onotragus) leche*, Gray.

♂. 463. Namwala.

66. *Kobus (Onotragus) robertsi*, Roths.

2. N'dola.

67. *Kobus (Onotragus) smithmani*, Lyd.

♂. 445. Lumpula River.

68. *Kobus (Onotragus) sp.*

♀. 444. Lumpula River.

69. *Kobus (Adenota) vardoni*, Liv.

♀. 3. N'dola.

♂. 447. Lufula River, N'dola subdistrict.

♂. 459, 501. Namwala.

70. *Epyceros melampus*, Licht.

♂. 214, 458. Namwala.

71. *Hippotragus equinus*, Desm.

- ♂. 505. N'dola.  
♂. 456. Namwala.

72. *Hippotragus niger*, Harris.

506. N'dola.  
♂. 466 ; ♀. 467. Kalomo.

73. *Tragelaphus scriptus* subsp.

- ♂. 486, 498 ; ♀. 499. N'dola.

74. *Limnotragus spekei*, Sclat.

- ♂. 508. Kative, near Abercorn.

75. *Strepsiceros strepsiceros*, Pall.

- ♂. 478. N'dola subdistrict.

76. *Taurotragus oryx*, Pall.

- ♂. 496, 497. N'dola.  
♀. 449. Mwana Stream, N'dola subdistrict.  
♂. 455. Namwala.

VII.—*A curious Case of a Hermaphrodite Frog.*

By W. HAROLD LEIGH-SHARPE, M.Sc. (Lond.).

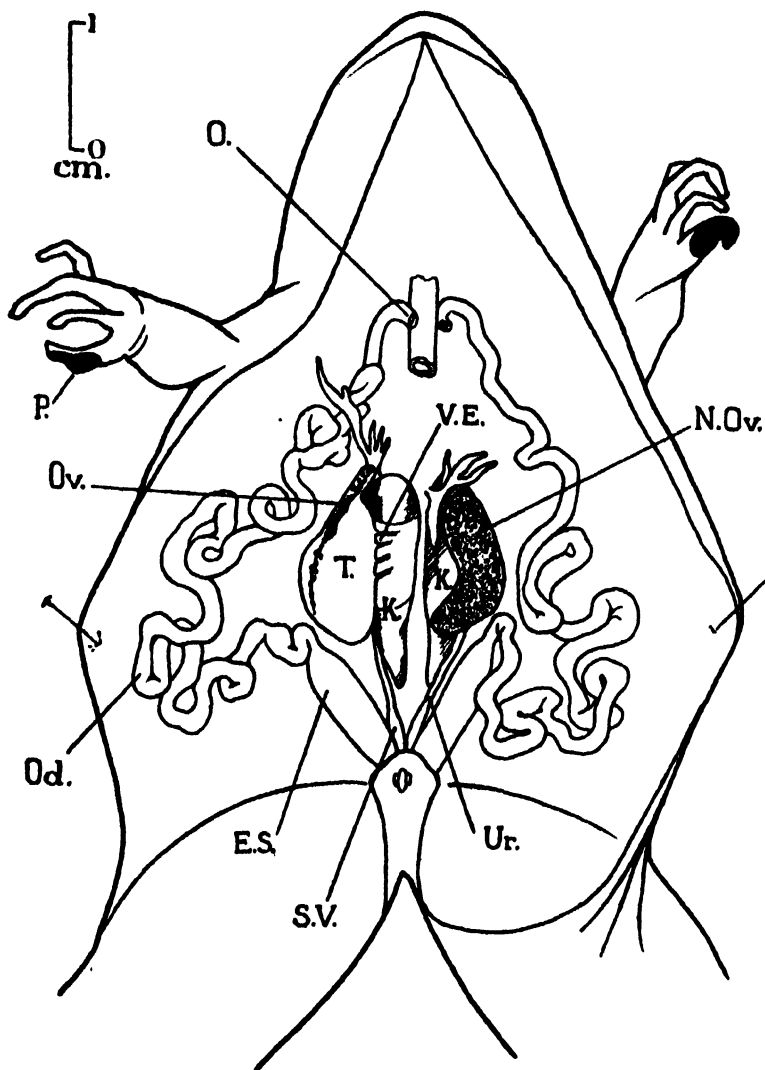
HERMAPHRODITISM in frogs is not uncommon, but that which came under my notice during the first week in March 1922 from the London area, and is preserved in the biological museum at St. Mary's Medical School, Paddington, is of special interest.

On the left side is a normal ovary—small, since it contains only the eggs that would have been laid next year.

On the right side is a misshapen but fairly large testis, capped at the anterior end by a minute ovary, containing ova to be laid the following season, the testis also bearing all along its outer border a small line of eggs. The usual vasa efferentia are present connecting the testis with the kidney.

Both oviducts are fully developed and their internal





Hermaphrodite frog. *P.*, pads on "thumbs"; *T.*, testis; *N.Ov.*, normal ovary; *E.S.*, egg-sacs; *K.*, kidney; *Od.*, oviduct; *O.*, internal opening of oviduct from coelom; *Ur.*, uroter; *S.V.*, seminal vesicle; *V.E.*, vasa efferentia; *Ov.*, ova along the edge of the testis.

openings from the coelom are open. The egg-sacs are pigmented, but the testis is not.

The mesonephric duct of the left side appears to function as a ureter, while that on the right has its distal end slightly dilated, suggesting the presence of a rudimentary seminal vesicle.

The horny epidermal pads are strongly developed on *both* "thumbs," and densely black.

The eggs of the present season have been laid and fertilized, and during the amplexus this animal conducted as a female. I am unable to state whether in any previous or subsequent amplexus it had or could conduct as a male, but from the structural evidence it seems not impossible—nor even unlikely.

The chief point of interest is that though a testis is present on one side only, the pads on the "thumbs" (male, secondary sexual characters) are developed on both—a case in nature parallel with Sir R. Owen's classical experiment.

VIII.—*Diagnoses of new Species of Non-marine Mollusca from Portuguese South-east Africa.* By M. CONNOLLY.

FULLER particulars and illustrations of the shells described below will be given in a more important treatise in the Transactions of a learned Society, before which it was read two years ago. However, the exorbitant cost of printing, which has so seriously affected scientific publication throughout the British Empire—although, judging from beautiful works recently received, it has not been allowed to influence the output in other countries—has delayed further progress towards its appearance; and, as some of these new species have been distributed for several years under their manuscript names, it seems advisable to publish them provisionally in this little paper, pending the production of the larger volume.

*Gonaxis cressyi*, sp. n.

Shell very small, oval, narrowly rimate, smooth, thin, glossy, transparent, pale olivaceous. Spire short, with parallel sides, axis almost straight, slightly bent backward at the bluntly pointed apex, which is only just visible from the front. Whorls 6, moderately convex, rapidly increasing,

with very faint transverse striation on the later ones, showing crenulation, under a lens, in the shallow sutures; the last whorl less rounded than its predecessor, and almost flat, receding somewhat towards the aperture in front. Aperture quadrate, rounded at the base; outer lip slightly receding; peristome white and shining, narrowly reflexed, columellar margin more so; rima very small; dentition none.

Long. 6·2; lat. 3·8; apert., alt. 2·2, lat. 2·0; last whorl 4·5 mm.

*Type-locality.* Mtisherra River Valley (*B. Cressy*).

*Gonaxis (Eustreptaxis) vengoensis*, sp. n.

Shell comparatively large, oval, rimate, thin, transparent, olivaceous, smooth and glossy in front, less so on back. Spire produced, left side very convex, right nearly straight; apex roundly conoid. Whorls  $6\frac{1}{2}$ , rather flat, rapidly increasing, the  $1\frac{1}{2}$  apical microscopically malleate and faintly spirally striate; the next four covered with close, prominent, oblique, transverse striæ, with spiral pitting in the interstices; except immediately below the suture on the back of the shell, the sculpture becomes very faint on the last whorl, which is almost smooth, especially in front; suture simple, shallow. Aperture quadrate, rounded at base; peristome white, shining, slightly thickened; columella straight, margin moderately reflexed over the rima; callus and dentition none.

Long. 25·2; lat. 14·6; apert., alt. 8·8, lat. 8·6; last whorl 19·5 mm.

*Type-locality.* District 15 miles north of Maccquenee (*B. Cressy*).

*Gulella enneadon*, sp. n.

Shell rather small, tun-shaped, broadly rimate, thin, transparent, faintly olivaceous vitreous. Spire produced, sides nearly parallel, slightly convex; apex bluntly rounded. Whorls  $7\frac{1}{2}$ , nearly flat, gradually increasing, the 2 apical smooth, remainder covered with close fine striæ, which are only just visible without a lens; suture shallow. Aperture nearly square, only slightly rounded at base, showing the following nine-fold dental process:—a small sharp denticle in the centre of the paries; a large curved parietal plait on its right; a large bifid tooth halfway down the outer lip; two minute denticles between the last-mentioned and the base; a small sharp basal tooth; and a two-cusped fold in the angle of the columella and paries; peristome shining, white, reflexed; rima circular.

Long. 6·2 ; lat. 3·3 ; apert., alt. 1·7, lat. 1·2 ; last whorl 3·5 mm.

*Type-locality.* District north of Macequece (*B. Cressy*).

*Gulella praelonga*, sp. n.

Shell elongate, cylindrical, rimate, somewhat calcined in the type, but normally thin, pale olivaceous, semi-transparent, with a silky sheen. Spire much produced, sides almost parallel, apex rounded to a blunt point. Whorls 7½, flattish, gradually and regularly increasing, the apical smooth, remainder covered with close, regular, almost straight, transverse striae, which extend into the sutures and are just visible without a lens ; suture shallow, but well-defined. Aperture subquadrate, only slightly rounded at base ; peristome white, very narrowly reflexed ; columellar margin more broadly so, almost concealing the rima. Dental processes three: an inconspicuous columellar fold or swelling ; a small parietal plait, starting at the junction of the outer lip and paries and only receding an extremely short distance within the shell ; and a very small single denticle, corresponding to a hardly noticeable external depression halfway down the outer lip.

Long. 8·8 ; lat. 3·5 ; apert., alt. 2·0, lat. 2·0 ; last whorl 4·1 mm.

*Type-locality.* Mount Vengo, Macequece District (*B. Cressy*).

*Gulella tristãoensis*, sp. n.

Shell small, rimate, cylindrical, rather thin, moderately glossy, transparent, pale olivaceous. Spire produced, sides parallel, apex bluntly rounded. Whorls 7, somewhat convex, gradually increasing, the last exceeding half the length of the shell ; the first 2 smooth and shining, remainder covered with close, prominent, regular, nearly straight, transverse striae ; suture well defined. Aperture nearly circular, outer lip somewhat bowed outward immediately below the suture ; columella almost straight ; peristome white, shining, reflexed ; dental processes three: a moderate-sized, almost straight, parietal plait, not reaching far within the shell ; a small sharp tooth on the slight sinuosity of the outer lip and a blunt fold on the columella, some distance within the aperture.

Long. 5·3 ; lat. 2·3 ; last whorl 2·8 mm.

*Type-locality.* District north of Macequece (*B. Cressy*).

*Sitala diaphana*, sp. n.

Shell small, imperforate, globose-conic, very thin, transparent, smooth, shining, pale yellow-corneous. Spire somewhat elevated, sides regular, meeting at an angle of about  $80^{\circ}$ ; apex pointed. Whorls 5, rapidly increasing, rounded, with very slight peripheral carination; covered on both sides and almost to the apex with very faint, irregular, straight, transverse striæ, which are only visible under a lens, and microscopic, close, spiral striæ, allowing the surface to appear smooth and polished to the naked eye; suture simple, well defined. Aperture rounded-lunate; peristome simple, acute; columella short and straight, upper margin very narrowly, solidly reflexed; callus none.

Diam. maj. 4.2, min. 3.8; alt. 4.0; apert., alt. 2.0, lat. 2.2 mm.

*Type-locality.* District north of Macequece (*B. Cressy*).

*Trachycystis ambigua*, sp. n.

Shell small, rimate, subconic-globose, very thin, translucent, rather dull, carneo-corneous. Spire a little elevated, apical angle about  $95^{\circ}$ ; apex pointed. Whorls 5, rounded, with faint peripheral carination, rapidly increasing, the apical smoothly punctate, remainder covered on both sides with extremely close, straight, transverse, microscopic striæ, with spiral sculpture commencing on the 4th and stronger, crossing the transverse striæ, on the 5th whorl; suture simple, moderately impressed. Aperture nearly semi-lunar; peristome simple, acute; columella very short, margin very narrowly reflexed, but almost covering the minute rima.

Diam. maj. 4.5, min. 4.0; alt. 3.7; apert., alt. 2.5, lat. 2.1 mm.

*Type-locality.* Head-waters of R. Inyamkarrara, 4500 ft. (*B. Cressy*).

*Trachycystis sericea*, sp. n.

Shell small, umbilicate, subglobose, rather thin, translucent, dark reddish corneous with a silky sheen. Spire slightly raised, apex bluntly rounded. Whorls 5, very round, rather gradually increasing, the apical half-whorl smooth, remainder prettily sculptured with very close, slightly curved, regular, prominent, transverse striæ, clearly visible without a lens, between each of which are 3 or 4 microscopic transverse striæ, the whole imparting a silky

lustre to the shell ; suture simple, deep. Aperture rounded-lunate ; peristome thin, simple ; columella short, upper margin narrowly reflexed, but not concealing the very narrow, though deep, umbilicus.

Diam. maj. 3·9, min. 3·5 ; alt. 3·2 ; apert., alt. 2·1, lat. 1·7 mm.

*Type-locality.* District 16 miles north of Macequece, 4500 ft. (*B. Cressy*).

NOTE.—The sculpture of the seven minute species which follow is described subject to a magnification of about 50.

*Trachycystis mcdowellii*, sp. n.

Shell very small, depressed, circular, umbilicate, thin, silky, translucent, corneous. Spire almost flat. Whorls 4½, rounded, slowly and regularly increasing ; protoconch faintly microscopically punctate, showing traces of transverse striation after the first whorl ; remaining whorls covered with very close, clear, nearly straight, transverse, microscopic striæ ; suture narrow, but well-defined. Aperture lunate ; peristome simple, acute ; umbilicus rather narrow, extending to the summit and just exposing all the whorls.

Diam. maj. 1·7, min. 1·5 ; alt. circa 0·8 mm.

*Type-locality.* Maforga Siding, B. & M. Railway (*B. F. McDowell*).

*Trachycystis rudicostata*, sp. n.

Shell minute, umbilicate, nearly flat, thin, transparent, pale corneous. Spire but little raised, apex submamillate. Whorls 3½, convex, rather rapidly increasing, the apical 1½ microscopically punctate and clearly, closely, spirally striate ; remainder sculptured on both sides with prominent, raised, curved, oblique, transverse liræ, increasing in distance toward the aperture and becoming lamelliform on the periphery ; between each of these are very close transverse, crossed by equally close spiral, striæ ; suture simple, deep. Aperture nearly circular ; peristome simple, columellar margin not reflexed, umbilicus wide and deep, extending to the summit and exposing all the whorls.

Diam. maj. 1·8, min. 1·6 ; alt. circa 0·9 mm.

*Type-locality.* Dargle, Natal (*H. C. Burnup*) ; also found on Mt. Vengo, Macequece (*B. Cressy*).

*Trachycystis soror*, sp. n.

Shell minute, depressed, conic-globose, umbilicate, thin, pellucid, pale corneous. Spire somewhat raised, apex rounded. Whorls  $3\frac{1}{2}$ , regularly, but not very rapidly, increasing; protoconch rather indistinctly microscopically punctate for half a whorl, and then showing rather distant radial striæ, corresponding to the lamellæ on the later whorls, which are sculptured with transverse lamellæ, of which there are about 20 on the last whorl, where they are from .12 to .15 mm. apart, interspersed with rather fine, irregular transverse, crossed by very fine spiral, striæ; suture well-defined. Aperture rounded-lunate; peristome simple, acute; umbilicus rather wide, extending to the summit and exposing all the whorls.

Diam. maj. 1.5, min. 1.3 mm. ; alt. circa 0.8 mm.

*Type-locality.* Mount Vengo, 5500 ft. (*B. Cressy*).

*Trachycystis pura*, sp. n.

Shell minute, depressed circular, umbilicate, thin, milky-translucent. Spire nearly flat. Whorls  $3\frac{1}{2}$ , slowly and regularly increasing, covered all over with close, strong, regular, nearly straight, transverse striæ, which are about .025 mm. apart on the last whorl, but closer together towards the apex, except on the first half of the first whorl, where they are slightly more distant than on the second half; protoconch furnished with almost invisible spiral striæ, which also occur round the umbilicus; suture narrow, but well defined. Aperture rounded-lunate; peristome simple, acute; umbilicus rather wide, extending to the summit and exposing all the whorls.

Diam. maj. 1.2, min. 1.05; alt. 0.7 mm.

*Type-locality.* Mount Vengo, 5500 ft. (*B. Cressy*).

*Trachycystis vengoensis*, sp. n.

Shell minute, umbilicate, depressed-globose, thin, translucent, reddish corneous. Spire nearly flat, each whorl just showing above the next. Whorls  $3\frac{1}{2}$ , rounded, gradually increasing, protoconch microscopically reticularly punctate, remainder covered on both sides with microscopic, close, straight, regular, transverse striæ, crossed by almost invisible spiral striation round the umbilicus; suture simple, deep. Aperture rounded-lunate; peristome thin, simple; columellar

margin not reflexed, umbilicus not wide, but deep, extending to the summit and disclosing all the whorls.

Diam. maj. 1.45, min. 1.35 ; alt. 0.4 mm.

*Type-locality.* Mount Vengo, 5500 ft. (*B. Cressy*).

*Punctum pallidum*, sp. n.

Shell minute, depressed globose, umbilicate, thin, glossy, pellucid, whitish corneous. Spire not much raised, apex smoothly convex. Whorls 4, slowly and regularly increasing, protoconch with microscopic spiral striae, of which about 1.4 are visible on the upper exposed portion ; remainder of shell covered with narrow, but well-defined, slightly oblique transverse striae, about 0.03 mm. apart on the last whorl, interspersed with finer ones, which are crossed by fine spiral striae, the latter best developed near the umbilicus ; suture shallow, somewhat margined. Aperture lunate ; peristome simple, acute ; umbilicus not wide, but deep, extending to the summit and just exposing all the whorls.

Diam. maj. 1.2, min. 1.1 ; alt. 0.4 mm.

*Type-locality.* Mount Vengo, 5500 ft. (*B. Cressy*).

*Nesopupa bandulana*, sp. n.

Shell minute, ovate, rimate, thin, smooth, glossy, semi-transparent, dark corneous-brown. Spire moderately produced, sides convex, apex rounded. Whorls 4½, moderately convex ; apex faintly microscopically punctate, later whorls sculptured with the same faint punctation and very faint, comparatively distant, slightly oblique, transverse striae, hardly apparent under 50-fold magnification ; suture simple, shallow. Aperture quadrate, narrowing and rounded at the base, with a pronounced sinus at the top of the outer lip ; peristome white, very slightly thickened ; columellar margin a little reflexed ; dental processes six : a deep-set, inrunning, mid-parietal plait ; a smaller one, a little nearer the surface, halfway between the last-mentioned and the outer lip ; three rather deep-set, equidistant, basal denticles, and an equally deep-set horizontal lamella on the columella. Rima of moderate size.

Long. 1.5 ; diam. maj. 1.0 mm.

*Type-locality.* Near Bandula Siding, B. & M. Railway (*B. F. McDowell*).



*Edouardia junodi*, sp. n.

Shell rather small, broadly conoid, umbilicate, thin, shining, yellowish corneous. Spire moderately elevated, with straight sides meeting at an angle of  $80^{\circ}$ ; apex mamillate. Whorls 5, regularly and rather rapidly increasing, very convex, the last rounded with only the faintest appearance of carination; apex practically smooth, remaining whorls sculptured with faint, close, regular, transverse striæ, hardly visible without a lens; suture impressed. Aperture nearly circular, descending a little when viewed from the front; peristome simple, acute; outer lip straight, hardly receding at all toward the base; columella rather concave, margin somewhat broadly triangularly reflexed, concealing from the front, but not covering, the round umbilicus, which is narrow, but very deep, extending to the summit.

Alt. 10.8; lat. 10.2; apert., alt. 6.6, lat. 5.0; last whorl 8.5 mm.

*Type-locality.* Lebombo Mountains (*H. A. Junod*).

*Opeas vengoense*, sp. n.

Shell very small, elongate-fusiform, imperforate, thin, smooth, shining, transparent, very pale olivaceous-vitreous. Spire produced, sides regular, apex rounded. Whorls  $5\frac{1}{2}$ , flattish, rapidly increasing, the first smooth, second microscopically very faintly, rather distantly, vertically striate; remainder covered with fine, regular, somewhat oblique, curved, transverse striæ, which are only visible under a lens; suture simple and shallow, but well-defined. Aperture elongate, acuminate-ovate, rounded at base; peristome simple, acute; outer lip slightly bowed forward; columella weak, concave, adunately thickened, but not truncate.

Long. 6.3, lat. 1.7; apert., alt. 1.8, lat. 0.7; last whorl 3.6 mm.

*Type-locality.* Mount Vengo, 5500 ft. (*B. Cressy*).

*Opeas cressyi*, sp. n.

Shell small, elongate-fusiform, imperforate, thin, shining, transparent, pale olivaceous-vitreous. Spire produced, sides gradually and regularly tapering, apex rounded. Whorls 7, rather convex, regularly and rather rapidly increasing, the first 2 faintly microscopically punctate, remainder covered with close, clear, regular, curved, transverse striæ, visible to the

naked eye; suture simple, somewhat oblique, pronounced, but not deep. Aperture elongate, acuminate-ovate; peristome thin, simple; outer lip a little curved outward, well arcuate forward below the suture, receding more gradually to the base; columella weak, concave, almost imperceptibly truncate.

Long. 10·8, lat. 2·8; apert., alt. 3·3, lat. 1·2; last whorl 5·7 mm.

*Type-locality.* District north of Macequece (*B. Cressy*).

*Auriculastra acuta*, sp. n.

Shell of fair size, fusiform, imperforate, rather solid, bleached white and dull in the type, but probably glossy and creamy-olivaceous in fresh condition. Spire somewhat produced, with straight sides meeting at an angle of about 48°; apex acute. Whorls 7, almost flat, regularly increasing, each being about one-third greater in altitude than its predecessor, sculptured with very faint, close, regular, almost straight, transverse striæ; suture extremely shallow, strongly margined below. Aperture inverse elongate-auriform, very acute at apex and narrowly rounded at base; outer lip simple, blunt, gently outcurved, straight in profile; columella calloused, short and straight, furnished with two deeply inrunning folds, of which the upper is by far the most prominent.

Long. 17·8, lat. 8·0; apert., alt. 10·3, lat. 2·7; last whorl 13·3 mm.

*Type-locality.* Estuary of Nkomati River, Rikatla (*H. A. Junod*).

*Hippeutis junodi*, sp. n.

Shell small, discoid, umbilicate, thin, smooth, shining, semi-transparent, reddish corneous. Spire much impressed. Whorls 4, rapidly increasing, each rising considerably above its predecessor, the last, which comprises practically the whole shell, rounded and convex above, sloping somewhat abruptly downward to the roundly-keeled base, slightly concave beneath; microscopically sculptured on both sides with close transverse striæ of irregular prominence, undulating with the curves of the outer lip; suture impressed. Aperture barbate, pointing slightly downward in profile, squarely quadrate from beneath; peristome thin, simple, the curve of the outer lip at first receding infinitesimally, then advancing slightly and receding rapidly above, almost

straight beneath and not extending into the umbilicus, which is not wide, but deep, extending to the apex and hardly disclosing all the whorls.

Diam. maj. 5·3, min. 4·7; alt. 1·5; apert., alt. 1·5, lat. 2·4 mm.

*Type-locality.* Nwambukoto, Rikatla (*H. A. Junod*).

*Assiminia leptodonta*, sp. n.

Shell very small, broadly ovate, imperforate, solid, shining, translucent, darkish brown. Spire moderately produced, with straight sides meeting at an angle of about 50°; apex acute. Whorls 6, almost flat above, but well rounded at the periphery and very rapidly increasing; the apical  $1\frac{1}{4}$  microscopically punctate, later whorls sculptured with very faint, straight, slightly irregular striæ or growth-lines, only visible under a strong lens, crossed by much finer, extremely close, microscopic, spiral striæ; suture flat, broadly and very strongly margined below. Aperture subovate, somewhat flattened at the base; peristome simple, acute; outer lip straight in profile and hardly receding; columella white, slightly concave, margin narrowly adnate; callus white and thin.

Alt. 5·2, lat. 3·4; apert., alt. 3·0, lat. 2·0; last whorl 4·2 mm.

*Type-locality.* Estuary of the Nkomati River, Rikatla (*H. A. Junod*).

IX.—*Some new Silurids from the Congo.*

By EINAR LÖNNBERG and HIALMAR RENDAHL.

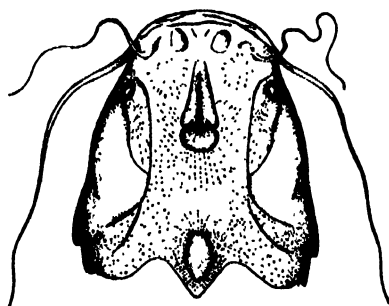
THE Silurids described below belong to the R. Nat. Hist. Museum in Stockholm.

*Clarias lualæ*, sp. n.

Depth of body about 9 times in total length, length of head  $4\frac{3}{4}$  times. Head  $1\frac{1}{4}$ – $1\frac{1}{2}$  times as long as broad, granular above. Occipital process angular. Fontanelles large; the frontal one has a rather peculiar shape, which is elucidated by the accompanying figure (fig. 1). Its anterior greater and somewhat blade-shaped portion partly divided from the posterior somewhat rounded portion by a pair of lateral processes. The occipital fontanelle is almost oviform and

extends broadly into the occipital process. Eye small, about  $4\frac{1}{2}$  times in snout and about  $6\frac{1}{2}$  times in interorbital width. Width of mouth about equal to interorbital width. Vomerine teeth conical, forming a crescentic band, which is nearly as broad as the premaxillary band, which is about 5 times as long as broad. Nasal barbel from  $\frac{1}{2}$  to  $\frac{2}{3}$  length of head; maxillary barbel not quite as long as head, reaching to tip of pectoral spine. Outer mandibular barbel about  $\frac{2}{3}$  and the inner about  $\frac{1}{2}$  length of head. 11 gill-rakers on anterior arch. Clavicles not exposed. Dorsal 72, its distance from

Fig. 1.

Head of *Clarias luako*. Nat. size.

the occipital process a little more than half the length of the head, its distance from caudal less than diameter of eye. Anal about 60, its distance from caudal less than diameter of eye. Pectoral about half as long as head; the spine  $\frac{1}{2}$  the length of the head, serrated in front. Ventrals not quite  $1\frac{1}{2}$  as distant from caudal as from end of snout. Caudal about  $\frac{2}{3}$  of length of head. General colour blackish brown above, not much paler below; all barbels black.

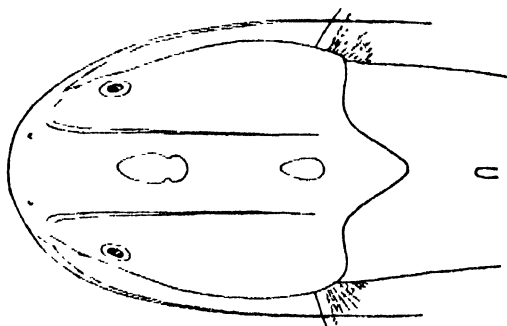
Two specimens, respectively 204 and 207 mm. Both from Luala River, a tributary of the Congo, near Kinkengi, Lower Congo. Collected by the Swedish missionary, Mr. B  rri  sson.

*Clarias brevinuchalis*, sp. n.

A species belonging to the same group as *C. liberiensis*, Steindachner, but differing from the same by the short distance between the occipital spine and the origin of the dorsal, the quite different position and shape of the fontanelles, etc.

Length of head a little more than  $3\frac{1}{2}$  times in total length. Head a little more than  $1\frac{1}{2}$  times as long as broad, covered by a soft skin, so that the fine granulations are not very conspicuous. Occipital process broadly and bluntly angular. Frontal fontanelle broadly sole-shaped, its width being contained  $2\frac{1}{2}$  times in its length; its anterior end on a level with the centre of the eyes; its length  $6\frac{1}{2}$  times in the length of head. Occipital fontanelle entirely in advance of the occipital process, its breadth contained  $1\frac{1}{2}$  in its length, and its length  $9\frac{1}{2}$  times in length of head. Eye very small, its diameter  $4\frac{1}{2}$  times in length of snout, about 6 times in inter-orbital width, which is contained  $2\frac{2}{3}$  times in length of head.

Fig. 2.

Head of *Clarias breviusculus*. Nat. size.

Band of premaxillary teeth  $4\frac{1}{2}$  times as long as broad. Vomerine teeth granular, forming a crescentic band as broad as premaxillary band. Nasal barbel about  $\frac{1}{2}$  length of head. Maxillary barbel reaching tip of pectoral spine or beyond. Outer mandibular barbel a little longer than head, inner mandibular barbel about as long as nasal barbel. Gill-rakers rather long, 22 on the first arch. Clavicles concealed under the skin. Dorsal 78, its distance from occipital process  $\frac{1}{2}$  of the length of head, almost in contact with caudal behind. Anal about 55, almost in contact with caudal. Pectoral spine rather strongly serrated on the inner side, while the outer one may hardly be termed anything but granular. Length of pectoral fin about equal to half the length of the head. Pectoral spine  $1\frac{7}{10}$  times in length of head. Distance

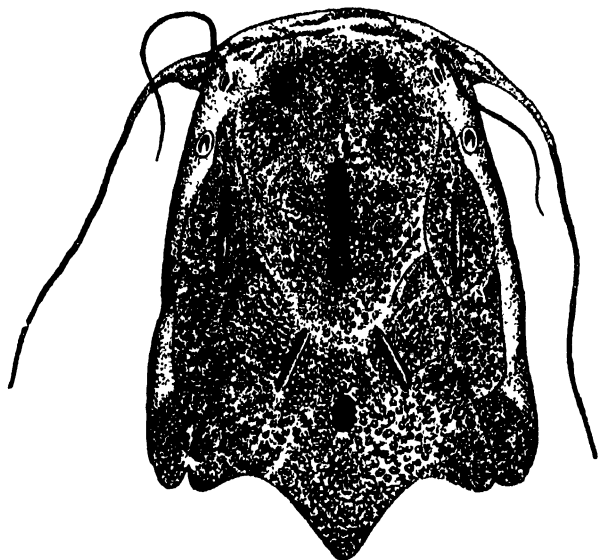
between snout and base of ventral contained nearly  $1\frac{1}{2}$  times in distance between base of ventral and caudal.

One specimen, 200 mm., collected in Upper Congo by Capt. E. Arrhenius.

*Clarias notozygurus*, sp. n.

Depth of body about  $6\frac{1}{2}$  times in total length, length of head  $3\frac{2}{3}$  times in total length. Width of head  $\frac{2}{3}$  of its length, its upper surface coarsely granulate; occipital process angular. Frontal fontanelle knife-shaped, 5 times as long as broad, its length about  $4\frac{1}{2}$  times in length of head; occipital

Fig. 3.

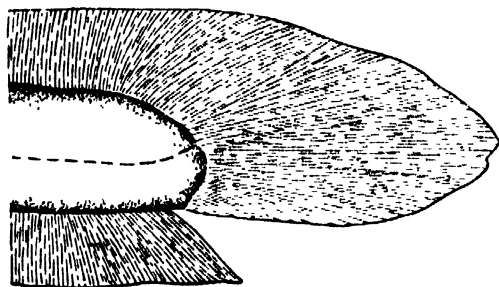


Head of *Clarias notozygurus*.  $\frac{1}{2}$  nat. size.

fontanelle well in advance of occipital process, elliptical about as long as diameter of eye. Diameter of eye  $7\frac{1}{2}$  times in interorbital width, which is contained not quite  $2\frac{1}{2}$  times in length of head. Band of premaxillary teeth  $6\frac{1}{2}$  times as long as broad. Vomerine teeth granular, forming a crescentic band which is a little broader than the premaxillary band. Nasal barbel about  $\frac{2}{3}$  length of head. Maxillary barbel a

little shorter than head, reaching to outer third of pectoral spine. Outer mandibular barbel nearly  $\frac{2}{3}$  length of head, inner about  $\frac{1}{3}$ . Gill-rakers closely set, 90 on first arch. Clavicles hidden. Dorsal at its posterior end completely confluent with the caudal, the number of rays about 68. Anal with approximately 50 rays, ending at a distance equalling  $1\frac{1}{2}$  diameters of eye from the root of the caudal. Pectoral fin about  $\frac{1}{2}$  length of head, the spine crenulated along the outer border of the basal half, about  $\frac{2}{3}$  length of head. Ventral about  $1\frac{1}{2}$  as distant from root of caudal as

Fig. 4.



Posterior end of *Clarias notozygurus*, to show relation between caudal and resp. dorsal and anal fins.  $\frac{1}{2}$  nat. size.

from end of snout. Caudal about  $\frac{1}{3}$  length of head. Dark olive-brown, probably whitish below. Barbels dark, but bases of mandibular barbels pale.

One specimen, 730 mm., from Lukosi, a tributary to Luala, Lower Congo, where it has been collected by the Swedish missionary, Mr. Börrisson.

#### *Eutropius bomæ*, sp. n.

A species belonging to the same group as *E. liberiensis*, Hubrecht, but differing from the same by its much smaller eyes, greater depth of body, different position of dorsal fin, etc.

Depth of body  $3\frac{1}{2}$  times in total length, length of head 5 times. Head a little more than  $1\frac{1}{2}$  times as long as broad. Snout broad, slightly projecting beyond mouth, a little more than  $1\frac{1}{2}$  as long as eye, which is perfectly lateral. Eye nearly 5 times in length of head,  $2\frac{2}{3}$  in interocular width. Width of mouth nearly equal to interocular width. Vomero-

palatine teeth forming an uninterrupted band, which is somewhat broader than that of the premaxillary. Nasal barbel not quite  $1\frac{1}{2}$  as long as diameter of eye. Maxillary barbel  $1\frac{3}{4}$  times in length of head. Outer mandibular barbel twice in head. Inner mandibular 5 times in head. Gill-rakers rather short, widely set, 4+8, on anterior arch. Dorsal I 6, almost entirely in advance of the ventral, its distance from end of snout  $\frac{3}{4}$  of its distance from the base of caudal. Dorsal spine rather slender, its upper fourth feebly serrated behind (8 small teeth in the type); its length is contained  $1\frac{1}{2}$  times in length of head. Anal 50, four anterior rays simple, the following gradually decreasing in length. Pectoral reaching ventral. The spine moderately serrated on the inner side, a little broader and somewhat longer than the dorsal one. Caudal deeply forked, with pointed lobes. Caudal peduncle only a little longer than deep. Silvery, pale brownish above, the blotch above the pectoral rather diffuse.

One specimen, 295 mm. (including caudal). Boma, Lower Congo, collected by Capt. C. J. Ekblom.

X.—*A Selection of Lectotypes of the typical Australian Marsupials in the British Museum Collection.* By OLDFIELD THOMAS.

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THE selection of lectotypes of the Australian rodents in the British Museum having already, even in the short time that has elapsed since it was done, proved of much convenience and benefit in working at them, I propose now to do the same with the marsupials.

It was Gould's habit, when describing members of that favourite group of his, the kangaroos, to describe the species from both male and female—these, therefore, being the co-types. And Gray, in less formal fashion, but with the same result, described many species on co-types instead of single specimens, so that a good many of the described forms need a selection of their lectotypes.

The co-types have all been recorded as such in the 'Catalogue of Marsupials,' and it has seemed convenient, in doing the selection, to make a reference in each case to the proper



page of that work and to the letter there distinguishing the specimens selected.

Whether considered valid or not, forms described on co-types have had their lectotypes selected. References to the names can easily be found by consulting the Catalogue.

Page.	Name.	Lectotype: letter, sex, and register no.
18.	<i>Macropus ocydromus</i> , Gould . . . . .	k. ♂. 44. 7. 2. 1.
22.	— <i>antilopinus</i> , Gld. . . . .	a. ♂. 42. 5. 26. 5.
24.	— <i>robustus</i> , Gld. . . . .	a. ♂. 41. 1009.
37.	— <i>greyi</i> , Gr. . . . .	a. ♂. 43. 1. 4. 42.
44.	— <i>agilis</i> , Gld. . . . .	f*. ♂. 41. 2. 15. 2.
47.	— <i>corem</i> , Gr. . . . .	a. ♂. 66. 4. 23. 1.
57.	— <i>houlmanni</i> , Gld. . . . .	l. ♂. 44. 2. 15. 10.
(62.	— <i>brevicaudatus</i> , (Gr.†.)	
66.	<i>Petrogale xanthopus</i> , Gr. . . . .	a. ♂. 55. 1. 12. 1.
69.	— <i>lateralis</i> , Gld. . . . .	b. ♂. 42. 5. 26. 3.
70.	— <i>brachyotis</i> , Gld. . . . .	a. ♂. 41. 1132.
81.	<i>Lagorchestes conspicillatus</i> , Gld.‡ . . . .	b. ♀. 41. 10. 12. 7.
84.	— <i>leporoides</i> , Gld. . . . .	b. ♀. 41. 1128.
102.	<i>Lagostrophus albipilis</i> , Gld. . . . .	a. ♂. 44. 9. 30. 2.
124.	<i>Hypsiprymnodon nudicaudatus</i> , Owen . .	c. ♀. 78. 1. 12. 2.
138.	<i>Acrobates pygmaeus</i> , Shaw . . . . .	d. ♂. 83. 3. 17. 1.
147.	<i>Dromicia concinna</i> , Gld. . . . .	e. ♂. 44. 7. 9. 12.
157.	<i>Petaurus ariel</i> , Gld. . . . .	a. ♀. 42. 5. 26. 1.
200.	<i>Phalanger m. ochropus</i> , Gr. . . . .	y. ♀. 60. 4. 23. 4.
248.	<i>Perameles fasciata</i> , Gr. . . . .	a. 41. 1178.
291.	<i>Phascogale unicolor</i> , Gld.§ . . . . .	i. ♂. 54. 11. 19. 2.
303.	<i>Sminthopsis ferrugineifrons</i> , Gld.§ . . . .	a. ♂. 54. 11. 19. 3.

\* I include this here because specimens *f* and *y* are called *co-types* in the Catalogue. But *f* is really the *type* (holotype), as no other specimen is referred to in the original description. This male was lent for description to Gould by Sir J. Richardson, and then transferred to the Museum at the same time as a number of Gould specimens.

† Specimens *b* and *c* are stated in the Catalogue to be co-types of Gray's *Halmaturus brevicaudatus*; but on the first appearance of the name—in 1838—it would appear to have been an accidental renaming of Quoy and Gaimard's *Kangurus brachyurus*, so that the Museum specimens would not have been co-types of it.

‡ Really the *type*, the original description containing no reference to Mr. Bynoe's specimen *a*, wrongly called co-type in the Catalogue.

§ The typical specimens of "*Antechinus*" *unicolor* and *ferrugineifrons* were collected by a Mr. Pamplin, who was also the captor of the *Pseudomys australis oralis* described by me in the 'Annals' for December 1921. Although the exact locality was not recorded for any of them, it seems probable that they were all from one region—namely, the coast district to the north of Sydney—for reasons indicated in my description of the rat. It appears to be not improbable that both the marsupials represent valid (though possibly exterminated) local races of the species to which I referred them in 1888.

XI.—On a new Subspecies of *Zaglossus*, with Remarks on other Species of the Genus. By OLDFIELD THOMAS and Lord ROTHSCHILD.

IN company with the mammals obtained in North-eastern New Guinea, in the region of the Saruwaged and Rawlinson Mountains, by the Dutch missionary Mr. C. Keysser, of which an account is given by Thomas in the 'Annals' for June 1922, there are four specimens of the rare and interesting animals referable to the genus *Zaglossus*.

In a paper\* on the members of this genus, published in 1912, Mr. Glover Allen has expressed the opinion that all are referable to a single species, the variation in their characters being so great that no specific or subspecific forms can be considered as tenable. Many of the points in this paper were dealt with by Rothschild in 1913 †.

In exactly the opposite direction, Dr. C. Kerbert, of Amsterdam, has not only recognized ‡, as we should do, that there are several tenable forms of the (usually) three-clawed *Zaglossi* of western New Guinea, but he has founded a new genus—*Prozaglossus*—for the five-clawed *Z. bartoni* of the eastern part of the island.

While Dr. Kerbert has undoubtedly got the juster view of the case—for the lumping of the whole of the genus into one species is obviously unjustifiable,—we are not prepared to recognize the genus *Prozaglossus* as valid; for though it is true that every known specimen of *bartoni* is five-clawed §, yet there is too much variation in the presence or absence of claws external and additional to the three central ones of *bruijnii* for their number to be considered as a generic character by itself.

Both Prof. Weber and Mr. Allen have recorded a number of variations in the claws, and to make this the basis of a generic division, in the entire absence of any cranial characters, would not, in our opinion, be at all advisable. No doubt *Z. bartoni* is quite a good species, and of this we now think we should make a special subspecies for the form which inhabits the Rawlinson Mountain region:—

*Zaglossus bartoni clunius*, subsp. n.

Similar to true *bartoni* in the presence of five claws on all

\* Mem. Mus. Harvard, xl. no. 5, p. 253 (1912).

† Nov. Zool. xx. p. 183 (1913).

‡ Zool. Anzeiger, xlii. p. 162 (1913).

§ Unless the "twijfelachtig soort" described in 1888 by Prof. Weber is a *bartoni* with one hind claw missing, as is not impossible ("Over een nieuwe soort van *Proechiūna*," Mededeelingen over Zoogdieren, Amsterdam, 1888).

the feet, in the long thick black fur (which nearly or quite hides the spines), in the thickly clothed spineless under surface, and in the uniform whiteness of the spines. But the size is less, as is shown by the skull-measurements, the brain-case shorter and narrower, and the rostrum proportionately and markedly more slender, its breadth at 40 mm. from the tip 10 mm. in the largest specimen, as compared with 13 mm. in the type of *bartoni*, and 12·8 mm. at 70 mm. from the tip as compared with 15·2 mm. All the four available specimens, representing both sexes, agree in the proportions of the skull and the peculiar slenderness of the snout.

Of the following skull-measurements, the first in each case is that of the type of *clunius* and the second that of the type of *bartoni*, and these will show the differences between the two forms :—

Total length 183, 184 mm.; basal length 171, 174; breadth of brain-case 54, 59·5; muzzle from level of lacrymal canal 117, 115; gnathion to back of palatal bones 160, 161; anterior root of zygoma to back of palatal bones 41, 49·5; least interorbital breadth 17·5, 20.

*Hab.* N.E. New Guinea. Type from the Saruwaged Mts., other specimens from the Rawlinson and Cromwell Mts.

*Type.* Adult female. No. R.M. 2. Collected by C. Keysser. Presented to the British Museum by Lord Rothschild. Four specimens examined.

[P.S.—In the above account Mr. Oldfield Thomas and I have only dealt with the five-toed *Zaglossus bartoni bartoni*, Thos., and its northern subspecies *Z. bartoni clunius*—i. e., the species of *Zaglossus* inhabiting New Guinea east of the Fly River. The species found west of the Fly River is the type of the genus *Zaglossus*, viz., *Zaglossus bruijni* (Peters and Doria). This species exhibits much greater external variation than does *Z. bartoni*, and I find at least six recognizable forms, four of which have been already named and described.

In spite of Mr. Glover Allen's very definite assertions, I am convinced, like Dr. Kerbert, that these forms are not individual aberrations, but represent well-defined local subspecies. Of the four described races, we know absolutely the locality of one of them only—*Zaglossus bruijni goodfellowii*, Thos.,—which was described from specimens captured on the island of Salwatti. Of the other three, we can safely assume the locality of the typical *Z. bruijni bruijni* to be the Arafak Peninsula (by the typical race I mean the pale-headed black-brown form described by Gervais, and assigned to *bruijni* by him, for the actual type of this form is a

skull of unknown origin). The remaining two, viz., *Z. bruijni villosissimus*, Dubois, and *Z. bruijni nigroaculeatus*, Rothschild, are of very doubtful origin, especially the latter, which was brought to England alive by a sailor.

I now proceed to describe two hitherto unnamed forms:—

*Zaglossus bruijni gularis*, subsp. n.

♀ ad. Similar to *Z. bruijni goodfellowii*, but larger; lacks all spines on the under surface, and has much heavier claws, especially on the fore feet. Skull very concave in occipital region above foramen magnum.

*Hab.* Foothills on south side of Charles Louis Mts., S.W. Dutch New Guinea.

Nine adult living examples and one young in spirit examined.

Type, no. 573 Tring Museum.

*Zaglossus bruijni pallidus*, subsp. n.

Differs from *Z. bruijni villosissimus* in having a whitish head and pale yellowish-brown pelage.

*Hab.* Inland from Geelvink Bay, Northern Dutch New Guinea.

Type no. 597 (Bruijn Coll.) Tring Museum.

I herewith append a key to the whole of the two species and eight forms of the genus *Zaglossus*:—

Key of *Zaglossus*.

- |    |   |                                    |
|----|---|------------------------------------|
| 1. | { Number of claws 3 or 4 .....                                    | 2.                                 |
|    | { Number of claws 5 .....   | 7.                                 |
| 2. | { Head whitish; body dark .....                                   | 3.                                 |
|    | { Head dark like body .....                                       | 4.                                 |
| 3. | { Black-brown; hair shorter, spines more exposed .....            | <i>Z. bruijni bruijni</i> .        |
|    | { Yellowish brown; hair longer, spines mostly concealed .....     | <i>Z. bruijni pallidus</i> .       |
| 4. | { Hair very long and thick, spines concealed .....                | <i>Z. bruijni villosissimus</i> .  |
|    | { Hair sparse, spines much exposed .....                          | 5.                                 |
| 5. | { Spines and hair blackish .....                                  | <i>Z. bruijni nigroaculeatus</i> . |
|    | { Spines white or whitish .....                                   | 6.                                 |
| 6. | { Spines on underside; smaller; claws slenderer .....             | <i>Z. bruijni goodfellowii</i> .   |
|    | { No spines on underside; very large; claws large and heavy ..... | <i>Z. bruijni gularis</i> .        |
| 7. | { Skull longer, rostrum thicker .....                             | <i>Z. bartoni bartoni</i> .        |
|    | { Skull shorter, rostrum more slender .....                       | <i>Z. bartoni clunius</i> .        |

ROTHSCHILD.]

XII.—*Exotic Muscaridæ (Diptera)*.—VI.\*

By J. R. MALLOCH, Washington, D.C.

Subfamily *PHAONINÆ*.Genus *MYIOSPILA*, R.-D.*Myiospila meditabunda*, var. *angustifrons*, n.

*Male and female*.—Similar to the typical form, differing in having the thorax of male darker, indistinctly vittate, the abdomen with much darker pruinescence and the paired spots larger and less clearly differentiated in male, and much more conspicuous in female. The frons of the male is much narrower in this variety than in the typical form, at the narrowest point being not wider than the distance between the posterior ocelli.

Length 7.5–8 mm.

*Type and allotype*, Gulmarg, Kashmir, 8500 feet, summer, 1913 (*F. W. Thomson*).

Genus *SPILARIA*, S. & D.*Spilaria cashmirensis*, sp. n.

*Male and female*.—Black, marked as in *lucorum*, Meigen, the thorax quadrivittate and the abdomen with paired spots and lateral checkerings on dorsum. The dorsal spots are less clearly defined and the cross-veins of wings are not perceptibly darkened.

*Male*.—Eyes hairy, more narrowly separated than in *lucorum*, the narrowest point about as wide as anterior ocellus; frontal bristles not extending to middle of orbits; parafacial a little narrower than in *lucorum*. Thorax as in that species, the hairs on hypopleura less numerous, sometimes absent, those on ventral surface of scutellum more numerous. Abdomen ovate, basal sternite bare. Fore tibia with a strong median posterior bristle; fore tarsus slender; mid-femur with some strong bristles on basal half of postero-ventral surface and some weaker bristles on basal half of antero-ventral; mid-tibia with three strong posterior bristles; hind femur with a rather densely placed series of antero-ventral bristles, the postero-ventral surface with a few short hairs apically; hind tibia with two antero-dorsal and eight or

\* For Part V., see *Ann. & Mag. Nat. Hist.* (9) ix., March 1922, pp. 271–280.

more antero-ventral bristles, the posterior surface with a series of long setulæ on median half. Venation as in *lucorum*.

*Female*.—Similar to the male, the frons one-third of the head-width.

Length 7–8 mm.

*Type*, male, allotype, and one female paratype, Gulmarg, Kashmir, 8500 feet, summer, 1913 (*F. W. Thomson*).

*Spiluria fuscoapicata*, sp. n.

*Female*.—Black, densely grey-pruinescent. Antennæ and palpi black. Thorax with four brownish-black vittæ anteriorly and a poorly defined central vitta posteriorly. Dorsum of abdomen with two pairs of large fuscous spots, one on second and the other on third tergite, and also with a faint central line and lateral checkerings blackish. Legs rufous, apices of femora narrowly blackened above, tarsi black, tibiæ a little infuscated at bases above. Wings clear, both cross-veins broadly blackish. Calyptræ whitish. Halteres yellow.

Eyes hairy, head normal. Thorax with four pairs of post-sutural dorso-centrals; prealar very short, but strong; scutellum and hypopleura as in *lucorum*; sterno-pleurals 2:2. Abdomen elongate-ovate, apical bristles on fourth tergite (5th) much weaker than those at middle. Fore tibia with a median bristle; mid-femur with three or four bristles on basal half of postero-ventral surface; hind femur with a series of long antero-ventral bristles, and some short bristles on basal half of postero-ventral surface; hind tibia with two or three antero-dorsal and three or four antero-ventral bristles, and one or two short setulæ near base on postero-dorsal surface. Outer cross-vein nearly straight; veins 3 and 4 divergent apically.

Length 8–9 mm.

*Type* and paratype, Kabete, Kenya Colony, 28. viii. 1914, on window (*T. J. Anderson*).

This species closely resembles *Mydæa quadruplex*, Stein, and *M. hirticeps*, Stein (= *mollis*, Stein), but both of these have three pairs of postsutural dorso-central bristles and differ otherwise, though Stein describes the female of the latter as having four pairs. There may be some error in his identification, as there are several closely related species.

Genus *Idiopygus*, Malloch.

I have only recently obtained access to a copy of Stein's paper on the Diptera collected by Alluaud and Jeannel in East Africa, and find that his *Mydæa trochanterata* belongs to

*Idiopygus*. This necessitates a change of name for *Idiopygus trochanteratus*, Malloch, described in Part III. of this series of papers. I therefore propose to substitute the name *ulundi* for the species.

Stein's species is very closely allied to mine, but whether or not it is the same, or is *hirtiventris*, Malloch, it is impossible to say without a careful examination of the type, which was, according to Stein, in poor condition. The legs of both my species are black, while in *trochanteratus*, Stein, the tibiæ are slightly reddish.

Stein's species came from Kilimandjaro, German East Africa, the others are also from East Africa. I have seen no species of the genus from the western part of that continent.

*Eulimnophora trimaculata* (Stein).

I have before me a male of this very striking species from the top of the Aberdare Mts., 9500 feet, 28. ii. 1911 (*T. J. Anderson*).

The fourth vein of the wing is very noticeably curved forward apically, the thorax has three black spots on the anterior margin, contiguous in front, only the median one extending to suture, and there are three contiguous black spots behind the suture; the sides of the abdominal tergites 1 and 2 are broadly yellowish, and the large subtriangular black spots form two almost entire submedian vittæ on the abdomen.

A slightly aberrant species, but quite evidently belonging to this genus.

Genus *RHYNCHOMYDÆA*, nov.

*Generic characters*.—Similar to *Cyrtoneura* in general habitus. Eyes of male subcontiguous, of female separated by a little less than one-third of the head-width, bare in both sexes; orbits of male with very fine short hairs, of female with bristles as in *Helina*, but only the upper one directed backward; arista long-plumose; face with a very conspicuous rounded ridge vertically in middle or tuberculate. Thorax with the dorso-centrals, except the posterior two pairs, very short, pteropleura hairy, prosternum hairy, hairs descending on sides of scutellum. Third wing-vein setulose at base, fourth curved forward apically.

Genotype, *Mydæa tuberculifacies*, Stein.

*Rhynchomydæa tuberculifacies* (Stein).

Originally described from Batavia. I have before me three specimens from Ceylon (*Yerbury*).

*Rhynchomydæa australis*, sp. n.

*Female*.—Differs from the genotype in having the thorax entirely yellow and the abdomen of the same colour, with a more or less distinct infuscation dorsally; the metanotum has a pair of blackish spots. Antennæ and palpi yellow. Legs tawny, tarsi fuscous. Wings yellowish, veins yellow.

Arista with shorter hairs than in genotype, the upper series duplicated only at base instead of on almost the entire length. Thorax as in genotype. Fore tibia without a median bristle; mid-tibia with two posterior bristles; hind femur with a few bristles on apical half of antero-ventral surface; hind tibia with one antero-dorsal and one antero-ventral bristle. Third wing-vein setulose from base almost midway to inner cross-vein; first posterior cell not so much narrowed as in genotype. Length 5–6 mm.

*Type*, Burpengary, South Queensland; three female paratypes, Queensland (*T. L. Bancroft*).

This is one of the most distinctive genera in the complex group listed under the generic name *Mydæa* by Stein. No other genus has the peculiar facial ridge. The genus *Mydæa* is found only in the Palæarctic and Nearctic regions so far as I have seen. *Mydæa carinata*, Stein, from Mt. Victoria, probably belongs here; it is unknown to me.

Australian *Helinæ*.

For the convenience of students of this family I am presenting a key to the Australian species of *Helina* in the material before me at this time. It may be possible to increase the synopsis on some future occasion:—

- |  |                             |
|--|-----------------------------|
| 1. Thorax and abdomen blue; knobs of halteres and legs black; eyes densely hairy; arista with long sparse hairs; cross-veins of wings not infuscated ..... | 2.                          |
| Thorax and abdomen not blue, sometimes with a cupreous or bronzy tinge, if it is slightly greenish the legs are tawny; other characters not as above ..... | 4.                          |
| 2. Calyptre without fuscous margins; post-sutural dorso-centrals 3; species averaging about 6 mm. in length .....  | <i>cærulescens</i> , Stein. |
| Calyptre without fuscous margins; post-sutural dorso-centrals 4 .....  | <i>regina</i> , sp. n.      |
| Calyptre with fuscous margins .....  | 3.                          |



3. Large species, 8-9 mm. in length; postsutural dorso-centrals 4; thorax and abdomen both with conspicuous pruinescence, the former distinctly vittate, the latter with a blackish dorso-central vitta ..... *whitei*, sp. n.
- Small species, 4 mm. in length; thorax with faint pruinescence and very faintly vittate; abdomen not pruinose ..... *tasmaniensis*, sp. n.
4. Thorax testaceous yellow, with three broad brownish-red vittæ which become fuscous posteriorly, the median one continued over disc of scutellum; pleura with a fuscous streak on upper margin from humeri to base of wing ..... *fusciflava*, Malloch.
- Thorax entirely or almost entirely black .... 4a.
- 4a. Halteres and legs black; thorax with three broad shining black vittæ; abdomen with iridescent checkerings, bronzy with greyish pruinescence, the apical margins of the tergites violet-coloured in some lights; frons of male about one-fourth of the head-width; eyes very inconspicuously hairy; arista long-plumose; wings with a brown spot at apex of auxiliary vein, one over inner cross-vein, and another on each end of outer cross-vein ..... *iridescens*, sp. n.
- Halteres pale; other characters not as above. 5.
5. Thorax with four pairs of postsutural dorso-central bristles ..... 6.
- Thorax with three pairs of postsutural dorso-central bristles ..... 9.
6. Longest hairs of arista longer than width of third antennal segment; legs tawny, tarsi fuscous; cross-veins not clouded; fore tibia without bristle at middle of posterior surface ..... *antarctica*, Bigot.
- Longest hairs on arista much shorter than width of third antennal segment; at least part of the femora in addition to tarsi infuscated; inner cross-vein and sometimes also the outer one distinctly clouded; fore tibia with a median posterior bristle ..... 7.
7. Legs black; hind tibia of male with a series of very long bristles on antero-ventral and another series on posterior surface; prealar bristle short, but distinct ..... *pæciliiventris*, sp. n.
- At least the tibiæ tawny; hind tibia of male with from two to four short antero-ventral bristles and no series such as above. .... 8.
8. Prealar bristle short, but distinct; almost entirely black; fifth abdominal sternite with normal hairing ..... *addita*, Walker.
- Prealar bristle indistinguishable from the adjoining hairs; mid and hind femora with their apical fifth tawny; fifth abdominal sternite with dense erect fine hairs, which are longer than usual ..... *piliventris*, sp. n.

9. Wing with a fuscous spot close against third vein just beyond outer cross-vein; both cross-veins broadly clouded ..... *trinubilifera*, sp. n.  
 Wing without a spot in first posterior cell as above, cross-veins clouded or unclouded.. 10.
10. Cross-veins of wings distinctly clouded; longest hairs on arista much shorter than width of third antennal segment; fore tibia with a median posterior bristle ..... *victoria*, sp. n.  
 Cross-veins of wings not infuscated; longest hairs on arista at least as long as width of third antennal segment ..... 11.
11. Bristles on antero-ventral surface of hind femur extending from base to apex; neither the posterior median bristle on fore tibia nor the posterior median setula on hind tibia present; thorax without strong presutural acrostichal bristles ..... *micans*, sp. n.  
 Bristles on antero-ventral surface of hind femur confined to the apical half, if on almost entire surface, the fore tibia has a median bristle ..... 12.
12. Fore tibia with a median posterior bristle; hind femur with an almost complete series of antero-ventral bristles; thorax with a very short pair of presutural acrostichal bristles; hind tibia without a posterior setula near middle ..... *spilariformis*, sp. n.  
 Fore tibia without a median posterior bristle. 13.
13. Thorax without a strong pair of presutural acrostichal bristles; abdomen without brassy or violaceous reflections; hind tibia without any setulæ near middle on posterior surface ..... *achæta*, sp. n.  
 Thorax with a pair of long presutural acrostichal bristles; abdomen with brassy or violaceous reflections; hind tibia with one or more weak setulæ on posterior surface near middle ..... *æneiventris*, sp. n.

*Helina cærulescens* (Stein).

Two male specimens of this species from Mangalore, Tasmania, 24. x. 1911 and 16. iii. 1913 (*A. White*).

The characters listed in the foregoing key will serve to distinguish this species from the next two, with which it forms a group that differs from any in the genus known to me from any part of the world. The general habitus of the forms is very similar to that of small *Calliphorinæ*, but no reliable characters are present that appear to justify their separation from other *Helina*.

*Helina whitei*, sp. n.

*Male and female*.—The largest of the three species and quite robust. Colours as stated in key, the thorax very conspicuously vittate. Wings hyaline.

*Male*.—Narrowest part of frons nearly as wide as third antennal segment; orbits setulose on their entire length; arista plumose; vibrissal angle not much produced; facial ridges haired more than midway to base of antennæ. Thorax without presutural acrostichals; prealar short. Fore tibia unarmed at middle; mid-tibia with three or four posterior bristles; hind femur with a complete series of short antero-ventral bristles, the postero-ventral surface with a few short setulose hairs; hind tibia with three or four short antero-dorsal bristles. Outer cross-vein oblique and much curved.

*Female*.—Frons about one-third of the head-width; hind femur with bristles on antero-ventral surface confined to apical half; hind tibia with one antero-ventral bristle. Otherwise as male. Genitalia normal.

Length 8–9 mm.

*Type*, male, Healesville, Victoria, 13. xii. 1914; allotype, Mangalore, Tasmania, 22. ii. 1913 (*A. White*).

Named in honour of the collector.

*Helina tasmaniensis*, sp. n.

*Male*.—A deep blue species, with greenish vitta lateral to the dorso-centrals on each side of thorax, and the abdomen with a greenish tinge posteriorly, the pruinescence almost absent.

Narrowest part of frons not wider than third antennal segment; parafacials linear, much narrower than in *whitei*. Fore tibia as in that species; mid-tibia with two posterior bristles; hind tibia with about three antero-dorsal and three antero-ventral bristles. Outer cross-vein not so oblique or curved as in *whitei*.

Length 4 mm.

*Type*, Mangalore, Tasmania, 20. iv. 1913 (*A. White*).

*Helina regina*, sp. n.

*Male and female*.—Black, with a distinct blue tinge, the abdomen almost entirely blue, with whitish pruinescence in checkerings as in many *Calliphorinæ*. Head black, cheeks more or less rufous brown, orbits silvery. Thorax quadri-vittate. Legs black. Wings hyaline. Calyptreæ white. Halteres with black knobs.

*Male*.—Eyes rather sparsely haired; frons at narrowest part about twice as wide as third antennal segment; orbits narrow, with bristles on their entire length; parafacial about as wide as third antennal segment; facial ridges haired midway to base of antenna; arista plumose. Presutural

acrostichals setulose, but no pair well differentiated; prealar minute or absent; postsutural dorso-centrals 4; sterno-pleurals 1:2; scutellum not haired on sides or venter. Abdomen ovate; basal sternite haired. Fore tibia without a median bristle; mid-tibia with two or three posterior bristles; hind femur with bristles on apical half of antero-ventral surface; hind tibia with one or two antero-dorsal and antero-ventral bristles. Costal thorn absent.

*Female*.—Similar to the male, the frons about one-third of the head-width; prealar bristle minute.

Length 7 mm.

*Type*, male, allotype, and ten paratypes, Burnett River, Queensland, 1915, reared from maggots in persimmons (*T. L. Bancroft*).

This species is not so pronouncedly blue as the preceding three species, but is very closely related to them. It also appears to be related to *nigrescens*, Stein, and *tibiella*, Stein, though it is impossible to say definitely without seeing these species. From the former it differs in having the wing without costal thorn and the arista much longer-haired; *tibiella* is Indian and has the tibiæ yellow; *nigrescens* was described from Australia, but is unknown to me.

#### *Helina iridescens*, sp. n.

*Male*.—An aberrant species with very distinctive coloration. Shining black, with dense whitish pruinescence. Frons velvety black, orbits, face, and cheeks with white pruinescence; antennæ and palpi black. Thorax with three broad black vittæ, which are distinctly shining, the median one slightly subdivided centrally. Abdomen shining; as the specimen is turned round, the white colour is replaced by black, and *vice versa* in the checkerings; the whole surface brassy except apices of the tergites, which are violaceous. Legs black. Wings hyaline, a faint cloud in subcostal cell, a large brown spot on inner cross-vein, and one on each extremity of the outer cross-vein. Calyptræ white, margins yellow. Halteres black.

Eyes almost bare, separated by about one-fourth of the head-width; orbits distinct, narrower than frontalia, with long bristles and fine hairs on their entire length; face concave in profile; antennæ reaching almost to mouth, the third segment broad; arista plumose. Thorax with three pairs of postsutural dorso-centrals, no presutural acrostichals, a very short prealar, and the sterno-pleurals 1:2. Abdomen narrowly ovate. Fore tibia unarmed at middle; mid-tibia

with two posterior bristles; hind femur with bristles on apical half of antero-ventral surface; hind tibia with two antero-ventral and two antero-dorsal bristles. Outer cross-vein curved; first posterior cell not narrowed apically.

Length 5.5 mm.

*Type*, Mangalore, Tasmania, 28. viii. 1911 (*A. White*).

*Helina antarctica*, Bigot.

A species very similar to *micans*, sp. n., in habitus.

Represented by one male and two females from Mangalore, and one male from Hobart, Tasmania, October and November (*A. White*).

*Helina pæciliventris*, sp. n.

This and the next two species are very closely related and resemble the group to which the European species *duplicata*, Meigen, belongs, but the eyes are hairy and there is no bristle near base of hind tibia on the postero-dorsal surface.

*Male and female*.—Black, shining, with dense greyish pruinescence. Thorax with four blackish vittæ. Abdomen with paired dorsal spots. Legs black. Wings slightly yellowish, inner cross-vein broadly, outer narrowly infuscated. Calyptræ yellow. Halteres dull yellow.

*Male*.—Eyes hairy; narrowest part of frons about as wide as third antennal segment; orbits setulose to middle; arista pubescent. Thorax without presutural acrostichals, the prealar small; postsutural dorso-centrals 4; sterno-pleurals 2:2. Abdomen clongate-ovate. Fore tibia with a median posterior bristle; mid-tibia with about six bristles, and some short hairs in an irregular series on posterior surface; hind femur with six or seven long bristles on apical half of antero-ventral surface; hind tibia with two antero-dorsal bristles, a series of long bristles on whole length of antero-ventral surface, and another on posterior surface. Outer cross-vein curved.

*Female*.—Differs in having the frons about one-fourth of the head-width at vertex, widened anteriorly; the hind tibia with two antero-dorsal and three antero-ventral bristles, and the outer cross-vein more broadly clouded.

Length 8 mm.

*Type*, male, Bagdad, Tasmania, 14. xii. 1912; allotype, and one female paratype, Brighton, Tasmania, 26. vii. 1913 (*A. White*).

*Helina addita*, Walker.

A widely distributed species in Australia, which is represented by specimens from Mangalore and Brighton, Tasmania (*A. White*), Burpengary, Queensland (*T. L. Bancroft*), and Victoria (*C. French*).

*Helina piliventris*, sp. n.

*Male*.—A larger species than the foregoing, with the wings slightly brownish and the spots on dorsum of abdomen less distinct. General colour and habitus as in *pæciliventris*.

Structurally similar to both the foregoing species, distinguishable as indicated in the key.

Length 8 mm.

*Type*, Mangalore, Tasmania, 1. iii. 1913 (*A. White*).

*Helina trinubilifera*, sp. n.

*Female*.—Black, shining, with dense brownish-grey pruinescence. Head black; frons opaque, orbits, face, and cheeks with whitish pruinescence. Thorax with four broad black vittæ, the submedian pair subcontiguous. Abdomen with a pair of large, irregularly-margined, black marks on dorsum of segments 2 and 3, which cover almost the entire disc, the other tergites irregularly marked with black also. Legs tawny, tarsi brown. Wings clear, both cross-veins and a round spot about middle of first posterior cell close to third vein dark brown. Calyptræ whitish, margins brown. Halteres yellow, knobs brown.

Eyes subnude; frons about one-third of the head-width, orbital bristles not very long; longest hairs on arista distinctly shorter than width of third antennal segment. Postsutural dorso-centrals 3; prealar very short. Fore tibia with a median posterior bristle; mid-tibia with three posterior bristles; hind femur with one preapical antero-ventral bristle; hind tibia with two antero-dorsal and three antero-ventral bristles; outer cross-vein almost straight.

Length 5 mm.

*Type*, Mt. Wellington, Tasmania, 3. x. 1912 (*A. White*); paratype, Victoria (*C. French*).

*Helina victoria*, sp. n.

*Female*.—Belongs to the same group as *addita*, Walker. Differs as stated in key. In colour more brownish, the cross-

veins of wings very broadly clouded, and the femora and tarsi tawny.

Eyes hairy; arista pubescent; frons normal. Prealar short; postsutural dorso-centrals 3; presutural acrostichals absent. Fore tibia with a median posterior bristle; mid-tibia with three posterior bristles; hind femur with a strong preapical antero-ventral bristle; hind tibia with two antero-dorsal and three antero-ventral bristles.

Length 6-7 mm.

*Type*, Victoria, 12. xii. 1914 (*A. White*); paratype, Victoria (*C. French*).

*Helina micans*, sp. n.

*Male*.—Similar in general habitus to *antarctica*, Bigot, which it very closely resembles. The colour of thorax and abdomen more brassy than in that species, and the abdominal checkering more iridescent. The antennæ and palpi are fuscous. Legs tawny, tarsi fuscous. Wings slightly yellowish, veins yellow basally.

Eyes hairy; narrowest part of frons at least as wide as third antennal segment (in *antarctica* the interfrontalia is obliterated above and the narrowest part of frons is much narrower than third antennal segment); arista plumose. Prealar very short; postsutural dorso-centrals 3; abdomen ovate. Fore tibia unarmed at middle; mid-tibia with three posterior bristles; hind femur with a complete series of antero-ventral bristles, and a series of setulæ on postero-ventral surface; hind tibia with two or three antero-dorsal and two antero-ventral bristles.

Length 10 mm.

*Type*, Mangalore, Tasmania, 24. xii. 1911 (*A. White*).

*Helina spilariformis*, sp. n.

*Female*.—A robust species like the preceding, and in many respects resembling the genus *Spilaria*, especially in having some fine hairs on the hypopleura below the spiracle. Black, densely grey-pruinose, the thorax with four black vittæ and the abdomen with blackish checkerings. Legs tawny, tarsi fuscous. Wings hyaline. Calyptreæ yellowish. Halteres yellow.

Eyes sparsely hairy; frons normal; arista plumose. Thorax with a short weak pair of presutural acrostichals, three pairs of postsutural dorso-centrals, and a short prealar; sterno-pleurals 1:2; scutellum bare on sides and below. Fore tibia with a median posterior bristle; mid-tibia with

two posterior bristles ; antero-ventral surface of hind femur with an almost complete series of bristles ; hind tibia usually with two antero-dorsal and two antero-ventral bristles.

Length 8 mm.

*Type*, Mangalore, Tasmania, 19. iv. 1913 (*A. White*) ; paratype, East Australia (*T. P. Lucas*).

*Helina achæta*, sp. n.

*Female*.—General colour as in the preceding species, but the wings more yellowish at base.

Eyes subnude ; frons normal ; longest hairs on arista at least as long as width of third antennal segment. Thorax with three pairs of postsutural dorso-centrals, a short but distinct prealar, and no presutural acrostichals. Fore tibia without a median posterior bristle ; mid-tibia with two posterior bristles ; hind femur with two preapical antero-ventral bristles ; hind tibia with two antero-dorsal and one antero-ventral bristle.

Length 7 mm.

*Type*, Mangalore, Tasmania, 16. iii. 1913 (*A. White*).

*Helina æneiventris*, sp. n.

*Male and female*.—Black, shining, with dense yellowish-grey pruinescence. The thorax is quadrivittate and slightly metallic-coloured, either cupreous or violaceous, and the abdomen is checkered, the colour varying from greenish to cupreous or violaceous.

General habitus as in *antarctica*, Bigot, but the eyes are as widely separated as in *micans*, from which it differs in chaetotaxy as stated in the key. The frons of the female is normal in width.

Length 9–10 mm.

*Type*, male, Mangalore, Tasmania, 15. ii. 1913 ; allotype, topotypical, 1908 ; one male paratype, topotypical, 1. xii. 1912 ; one female paratype, topotypical, 21. xi. 1912 (*A. White*).

XIII.—*On Bandicoots allied to Perameles bougainvillei.*

By OLDFIELD THOMAS.

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IN the 'Catalogue of Marsupials'\*, in the absence of Shark's Bay specimens representing true *Perameles bougainvillei*, and more or less following Gould's determinations, I assigned

\* P. 246 (1888).



the bandicoots of this group to two forms—*P. bougainvillei typica*, of Western Australia, and *P. b. fasciata*, of South Australia and New South Wales. Since then the arrival of specimens from the islands of Shark's Bay—the type-locality of *bougainvillei*—has shown that that animal is smaller than the ordinary W.-Australian striped bandicoot, and that the latter should have Wagner's name of *myosuros*—or, rather, *myosura*—applied to it, as indicated in 1906\*.

On now examining the specimens from S. Australia and New South Wales, I find that these are distinguishable from each other, the teeth of the latter being much larger than those of the former, so that instead of the two forms—“*bougainvillei*” (properly *myosura*) and *fasciata*,—as recognized in the Catalogue, there are really four.

After selecting specimen *a* of *fasciata*, from the Liverpool Plains (B.M. no. 41.1178), as its lectotype, the names, characters, and localities of the four forms would appear to be as follows:—

- |  |  |
|--|--|
| A. Size small; skull of male only about 57 mm. in length; bullæ very small; <i>ms</i> <sup>1-3</sup> about 8.8 mm. (Shark's Bay, Western Australia.) | 1. <i>P. bougainvillei</i> , Q. & G.         |
| B. Size large; skull of male over 60 mm.; bullæ larger.  |  |
| <i>a</i> . Teeth smaller and lighter. Muzzle more slender. <i>Ms</i> <sup>1-3</sup> about 10 mm...   | 2. <i>P. myosura</i> , Wagn.                 |
| <i>a</i> <sup>2</sup> . Dark bands comparatively indistinct, not crossing back. (W. Australia.)  | 2 <i>a</i> . <i>P. myosura myosura</i> .     |
| <i>b</i> <sup>2</sup> . Dark bands more distinct, perceptible across back. (S. Australia.)   | 2 <i>b</i> . <i>P. m. notina</i> , subsp. n. |
| <i>b</i> . Teeth larger and heavier. Muzzle more conical. <i>Ms</i> <sup>1-3</sup> about 11 mm. (New South Wales.)                                   | 3. <i>P. fasciata</i> , Gray.                |

*Perameles myosura notina*, subsp. n.

External characters almost exactly as in *P. fasciata*, as described in the Catalogue and as figured by Gould; but skull, as in *myosura*, with more slender muzzle and smaller teeth.

Dimensions of the type:—

Head and body (on stuffed specimen) 280 mm.; tail 90; hind foot 56.

Skull: greatest length 68; condylo-basal length 66; nasals 29 × 5; interorbital breadth 14.5; anterior palatine foramina 8; bulla 7.5. Dental length 37; molars <sup>1-3</sup> 9.8.

*Hab.* South Australia. Type from the “plains near the

\* P. Z. S. 1906, p. 777.

head of the St. Vincent Gulf"; other specimens from the Murray River (*Gould*) and Adelaide (*Fortnum*).

*Type.* Adult male. B.M. no. 43. 8. 12. 21. Specimen *d* of *P. bougainvillei fasciata* of 'Catalogue of Marsupials.' Collected and presented by Capt. Sir George Grey.

XIV.—*Previously undescribed Scolytidæ and Platypodidæ from the Indian Area.* By Lt.-Col. F. WINN-SAMPSON, F.E.S.

A VERY large amount of material has been received from Mr. C. F. C. Beeson, Imperial Forest Zoologist, Dehra Dun, and the following are some of the hitherto-undescribed specimens; the remainder will be dealt with as soon as possible.

*Crossotarsus errans*, sp. n.

Brown; elytra darker apically than the prothorax. *Front* wrinkled and coarsely longitudinally rugose, depressed centrally, slightly hairy, with large shallow umbilical markings; the vertex with three shining carinæ, the central one ending abruptly anteriorly. *Prothorax* oblong, with a longitudinal median line on the basal third, on either side of which are a few punctures of slightly different sizes, the larger being nearest the base; the rest of the surface irregularly corroded and sparsely punctured except just anterior to the median line. *Elytra* nearly one-third longer than, and the same breadth as, the prothorax at the base, but diverging towards the apex, the basal margin acutely raised and smooth; broadly sulcate and deeply impressed after the basal third, which is lightly sculptured, the third and fifth interstices are basally tuberculate, the tubercles on the latter being the larger, the first and fourth are terminated before the declivity, the second, third, and fifth being the most prominent, and all are very slightly punctured; the apex abruptly declivous, with rows of piliferous tubercles, which cease just before the apical margin, which is furnished with four spines on each elytron, the first being an extension of the sutural angle, the other three are placed laterally, the one furthest from the apex being formed by the prolongation of the ninth interstice and is more pointed than the others.

Length 3.2 mm.; breadth 0.8 mm.

Burma: Mohnyin R., Katha (C. F. C. Beeson), ex *Careya arborea*.

♀. Reddish brown, the head and elytral apex darker. *Front* rugose, coarsely punctured, transversely depressed over the epistoma, which is slightly sinuate, the whole surface hairy. *Prothorax* anteriorly corroded, the remainder sparsely punctured, the median basal groove extends for about one-third the length of the prothorax, with groups of punctures on each side, larger than in the male, and those nearest the base larger than the anterior ones. *Elytra* the same breadth as and nearly half as long again as the prothorax, broadly sulcate, but less impressed than in the male; the basal third lightly sculptured, the third interstice strongly transversely carinate for a short distance from the base, the fifth interstice bearing a few uniseriate granules; the declivity rounded, with uniseriate piliferous punctures, but becoming flat with a granular hairy surface before the apex; the apical margin transversely truncate, the suture raised and shining, the outer sutural angles clearly defined.

Length 3.4 mm.; breadth 0.9 mm.

Burma: Mohnyin R., Katha (C. F. C. Beeson), ex *Careya arborea*.

Type in the British Museum.

Very similar to *Platypus indicus*, Strom., which was first described as belonging to the group *P. sulcati*, Chap., but in the same author's 'Catalogue of the Platypodidæ' is placed as "*incertæ sedis*," although it would appear to be a *Crossotarsus* of the group *C. subdepressus*, Chap. It may be here pointed out that there seems to have been some error in the placing of the male type label on the specimen in the collection of Mr. H. E. Andrewes, as the one so named is an undoubted female, of which sex Herr Stromeier gives no description. In the same collection there is a label (but not a type one) in the same handwriting, which is Stromeier's, placed on a male specimen, but it has no sex-mark. Under the circumstances, a description of the female is here added for comparison with that of *C. errans*.

*Crossotarsus (Platypus) indicus*, Strom.

Reddish brown, the elytra darker apically; antennæ, legs, and abdomen pale. *Front* subconcave, rugose, anterior half pale, the whole surface variolous, hairy towards the vertex, longitudinally strigose laterally, a small tuft of yellow hair over the mouth. *Prothorax* with the surface sparsely punctured, anteriorly finely rugose, the central longitudinal groove extends from near the base to the centre with a small

group of pores on each side, those nearest the base being the largest. *Elytra* striate-punctate at the base, the striae becoming broad, flat, and rugose from the basal third, the interstices being reduced to narrow shining carinae and ceasing at the declivity; the fourth, sixth, and eighth interstices are almost obsolete from the basal third, the base of the third interstice is plain, the elytral basal margin is narrow, smooth, and raised, the declivity abruptly truncate, subopaque, with a shagreened surface, the interstices being represented by a series of somewhat irregularly placed tubercles; the sutural angle is extended apically into a short, broad, outwardly curved process on each elytron, very similar to those on the male, which, however, are more slender and almost straight.

India: Nilgiri Hills. (*H. L. Andrewes*).

Type in Mr. H. E. Andrewes's Coll.

In most specimens of the male there are a few conspicuous punctures on each side of the prothoracic line, but often very obscure.

*Platypus decens*, sp. n.

Elongate, reddish testaceous, elytra darker towards the apex. *Front* flat, rugose, with scattered punctures and a short, central, longitudinal impression below the centre, vertex subangular, with a shining central line, sparsely punctured and laterally dull. *Prothorax* one-third longer than broad, very narrow median groove from near the base to the centre and laterally punctured, the number of punctures increasing towards the anterior end of the groove, the whole surface finely and irregularly punctured except the anterior portion of the disc. *Elytra* faintly striate-punctate, the sutural stria being the most deeply impressed; interstices 1, 3, and 5 are elevated basally, and the apex of the elytra has an oblique terminal impression, its margin diverging from the suture above the impression, and forming an emargination with rounded sides, the external angles curved downwards and backwards, the outer edge being serrate; the impressed surface very shining, concave above the external angles, the apical emargination wider than deep, with a median, strong, somewhat flattened, sharp tooth on each side pointing inwards and upwards, the external apical angles rounded, the inner sutural termination being nearly right-angled.

Length 3.2 mm.; breadth 0.7 mm.

Assam: Nowgong (?) Div., ex Sal.

Type in the British Museum.

This species belongs to the group *Cupulati* of Chapuis, and resembles *P. calamus*, Bldf., in the structure of the elytral sutural margin, and *P. chevrolati*, Chap., in the terminal depression, which is, however, somewhat differently toothed, as well as larger.

*TROGLODITICA*, gen. nov.

Head flattened, but not rostrate, eyes entire, elongate, and flat; antennæ long, the scape curved and slightly enlarged apically, the funiculus 7-jointed, the first joint large, globose, and hairy, the second subconical, the remainder transverse, increasing in breadth, and hairy; the club compressed, oblong, longer than the funiculus, and divided by two transverse septa, one nearly central, the other subdividing the basal half; the whole surface closed with stout hairs and centrally porous; mandibles stout and prominent; maxillæ externally very hairy, the inner margin provided with flat spines, maxillary palpi short and almost equal in length, the mentum broad but narrowed basally, laterally hairy at the base of the palpi, ligula inserted above the centre of the mentum, the labial palpi long, the first and third joints longer than broad, the second transverse. *Prothorax* slightly excised laterally. Meso- and metasternum both very short; anterior and middle coxæ both widely separated, the anterior tibiæ abruptly enlarged distally, rounded and strongly calcarate, the tarsal joints with the under surface thickly hairy, the third joint simple.

This genus strongly resembles *Sphærotrypes*, Bldf., in external appearance, but differs in the formation of the antennal club, eyes, etc. It is separated from *Diamerus*, Er., by the antennal club and tibiæ, and from *Dendrosinus*, Chap., by the antennal club, third tarsal joint, etc.

*Trogloditica trahax*, sp. n.

Black to dark brown. *Front* flattened, minutely granular, and covered with short, thick, recumbent hairs, epistoma prominent with a row of brilliant yellow hair below, the vertex very minutely shagreened and subopaque, central carina very narrow and shining. *Prothorax* transverse with piliferous punctures, the hairs short, thick, and pale in colour, the anterior margin bisinuate, elevated centrally, with two small prominent tubercles, anteriorly sparsely tuberculate, laterally slightly depressed, strongly and narrowly produced basally, with a central, longitudinal, smooth, and shining line. *Elytra* very convex, striate-punctate, interstices flat,

with rows of grey scales; viewed dorsally, the elytra present the appearance of being transversely truncate, but this is caused by the coalescence of the fifth, sixth, seventh, and eighth interstices before reaching the apex, and a consequent slight lateral elevation on each elytron; the sutural angle is sharply defined and the apical margin raised.

Length 2.3 mm.; breadth 1.7 mm.

Siam: Rajburi and Chiangmai Div.

Type in the British Museum.

*Webbia 30-spinatus*, sp. n.

Head black, prothorax dark brown, legs and elytra (except the apical portion, which is darker) pale yellow. *Front* convex, coarsely and sparsely punctured on a shagreened ground, with a narrow longitudinal carina from the mouth halfway to the vertex and slightly raised centrally, and over the mouth a transverse ridge of hair. *Prothorax* subquadrate, granulate anteriorly, with short erect hair, minutely and regularly punctured posteriorly on a shagreened surface, slightly broader apically, the anterior surface indented centrally, with a few coarse curved rugosities laterally, the actual anterior edge being bent under and not visible from above. *Elytra* hardly one-sixth longer than, and equal in breadth to, the prothorax, faintly striate-punctate, the interstices flat and irregularly punctured, the declivity commencing at the apical third, abruptly truncate, fundus flat and margined by fifteen spines on each elytron, decreasing in size towards the centre and increasing again to the apex; the fundus is provided with four rows of raised and roughened circular piliferous bosses which have a granular surface, the sutural row being much raised and broadened centrally, the remainder of the surface being flat and very finely granulate.

Length 3 mm.; breadth 1 mm.

Burma: Kaing R., Pyimana (C. F. C. Beeson).

Type in the British Museum.

The sutural elevation on the fundus is caused by a cluster of the bosses which are uniseriate in the other rows.

*Webbia 26-spinatus*, sp. n.

Differs from *W. 30-spinatus* in the rather more abruptly truncate declivity, the more obscure striæ, the number of marginal spines on each elytron; it is also darker in colour, and the prothoracic tubercles are coarser.

Length 2.8 mm.; breadth 1 mm.

Burma: Kaing R., Pyinmana (C. F. C. Beeson).

*Webbia pabo*, sp. n.

Head and prothorax dark brown, elytra yellowish brown, darker at the commencement of the declivity. *Front* convex, sparsely punctured over the mouth, the surface finely undose, polished towards the vertex, with a few minute irregular punctures, longitudinal carina short. *Prothorax* one-half longer than broad, subparallel-sided to the anterior fifth, and then rounded to the very obtuse anterior margin, which is broader than the head and hairy, the anterior third closely tuberculate, the tubercles slightly smaller posteriorly and abruptly ceasing at the anterior third; the rest of the surface shagreened and dull in colour, the base sinuate. *Elytra* the same breadth as the prothorax, and longer by the length of the oblique declivity; sides parallel, feebly punctate-striate, interstices flat, shining, broad, with a few irregular and very minute punctures; the declivity obliquely truncate, each interstice ending in a small serration or tooth at the margin of the fundus, which is shining, darker in colour, with obscure striae punctures, and hairy; about two-thirds from the commencement of the declivity on each elytron, and equidistant from the suture and the lateral edge, there arises a stout, somewhat flattened process directed upwards and backwards, at right angles to the surface of the declivity, and ending on the upper inner edge in a sharp inwardly-curved spine, and on the lower outer edge in a much shorter straight spine; the surface of the fundus below these processes is smooth, and the margin, viewed laterally, is seen to be hollowed out so as to form a pointed angle on the exterior edge just below the level of the base of the above-mentioned processes, and the sutural apical angles of each elytron are extended into stout divergent subtriangular spines.

Length 2.1 mm.; breadth .7 mm.

India: Kheri Lakhinpur, U.P. (C. F. C. Beeson), ex Sal. Type in the British Museum.

The length given above does not include the processes on the elytra.

*Sphærotrypes 4-tuberculatus*, sp. n.

Head and prothorax variegated in colour, owing to minute scales, the elytra reddish brown, darker towards the base. *Front* flat, centrally covered with minute forked scales, which become smaller laterally; the surface behind the eyes and the vertex very dark in colour and finely rugose, with a transverse row of longish hairs over the epistoma; the upper portion of the bipartite eyes very flat and widely separated

from the lower, the mandibles broad, especially basally. *Prothorax* transverse, gradually narrowed anteriorly and clothed with small scales interspersed with larger ones; a subtriangular dark patch extends from the anterior margin, narrowing to the centre; anteriorly transversely depressed, the basal extension somewhat acute. *Scutellum* elongate and rugose. *Elytra* slightly broader and twice as long as the prothorax, the striæ furnished with uniseriate subrectangular impressions, the interstices subconvex, rugose basally, coarsely and irregularly punctured, the first interstices with uniseriate, the remainder with more or less irregular biseriate stumpy scales, which become uniseriate towards the apex, the scales on the lateral interstices are longer and more slender; the sutural edges are furnished with rows of very minute hairs; the elytral base is transversely rugose with a crenate margin, but not overlapping the prothorax; the second and third interstices terminate in a strong tubercle, a similar but smaller tubercle being visible at the junction of the fifth, sixth, seventh, and eighth interstices; there are two or three tubercles on the third and fifth interstices on the declivity. The female is slightly larger than the male, and the elytral tubercles are much smaller and indistinct, there is also a faint longitudinal median elevation on the front of the latter.

♂. Length 3 mm.; breadth 2.2 mm.

♀. Length 3.3 mm.; breadth 2.3 mm.

Assam, Chittagong (C. F. C. Beeson), ex *Drimycarpus racemosus*.

Type in the British Museum.

*Xyleborus perparvus*, sp. n.

*Elytra* and anterior portion of the prothorax dark brown to black. *Front* subconvex, minutely granular, with punctures towards the vertex and a transverse row of hair over the epistoma. *Prothorax* slightly longer than broad, the sides nearly parallel to the apical third and then rounded to the front; anteriorly transversely rugose to the centre, which is not raised, posteriorly scantily punctured, the punctures rather more marked near the base, which is slightly sinuate. *Elytra* equal in breadth and a third longer than the prothorax, obscurely striate basally and more or less transversely rugose, the interstices flat, with piliferous punctures, to about the centre, and then with piliferous tubercles to the apex; the declivity abrupt and opaque, the striæ very faintly punctate and broad; viewed dorsally the apex is seen to be furnished with tubercles, which are continued on the seventh interstice some distance up the sides;



the uniseriate hairs on the striæ are much shorter than those on the interstices.

Length 1·7 mm. ; breadth 0·6 mm.

Bengal : Kurseong Div.

*Xyleborus major*, Stebb., ♂.

Yellowish-brown elytra, the prothorax reddish. *Front* narrow, centrally flat, and shining ; anteriorly with a short, longitudinal, central depression and laterally with large piliferous punctures ; deeply hollowed towards the vertex, laterally sharply angled, the facets of the eyes coarse. *Prothorax* subglobose posteriorly, but extended and narrowed forwards and downwards over the head, the front and sides of the extension being contracted and recurved, with a central anterior erect tubercle, laterally rounded ; rugose anteriorly as far as the central transverse node, posteriorly polished plain, and slightly depressed centrally, rather coarsely punctured laterally, and clothed with long and very fine hairs ; the frontal extension viewed dorsally is rugose, with a central carina, the sides darker in colour, the exposed under surface of the anterior extension is coarsely punctured and hairy. *Elytra* narrower than the broadest part of the prothorax, and about one-tenth longer (including the extension), striate-punctate, the striæ furnished with series of short hairs ; the interstices slightly convex, with uniseriate piliferous punctures (the hairs being very long), these punctures being replaced on the declivity by piliferous tubercles ; the sides of the elytra are subparallel to the apical fourth, and are thence abruptly narrowed to form the somewhat acute apex.

Length 4·5 mm. ; breadth 1·7 mm.

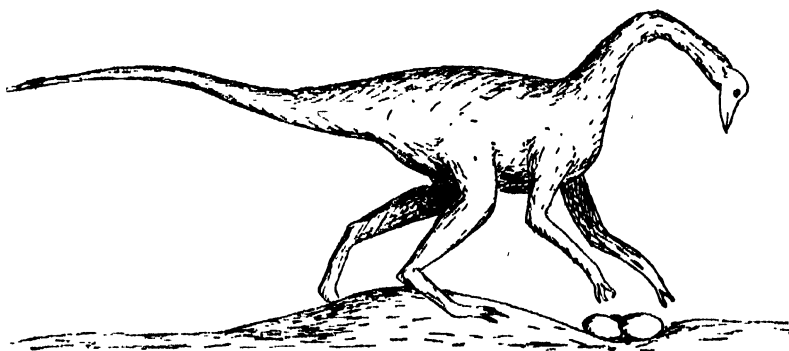
Khariabander, P.F., Lower Tondou (C. F. C. Beeson), ex Sal.  
Type in the British Museum.

XV.—On the probable Habits of the Dinosaur *Struthiomimus*.  
By Baron FRANCIS NOPCSA, Foreign Corresp. Geol. Soc.  
London.

EVER since the discovery of *Struthiomimus* its mode of life has been a puzzle to American palæontologists, and, as far as I am aware, no satisfactory explanation has yet been found. Though a descendant of some carnivorous theropodous Dinosaur, *Struthiomimus* shows an edentulous beak, and thus it

becomes evident that it did not live in the usual theropodous manner. The following review of the function of the different organs of *Struthiomimus* will, perhaps, shed some light on its mode of living:—

(1) The strong muscles of the femur and the slender elongated metatarsus of the hind feet of *Struthiomimus* show that it either hunted itself some very swift-running prey or that itself was often hunted. For reasons already put forward by Osborn, the first of these two possibilities has to be eliminated. The toes of the hind feet are comparatively short and the phalanges are rather strong. This shows that the foot could be easily used for scratching or for digging in loose material. This has likewise been recognized by American palæontologists, and thus the whole structure of the hind foot proves that *Struthiomimus* was an inhabitant of the open country,



A reconstruction of *Struthiomimus*.

where it raced along at great speed when pursued, and that it probably avoided marshy ground and such covered with dense vegetation like brushwood, ferns, or large-leaved plants. In this regard *Struthiomimus* came evidently nearer to the ostrich than to the moa.

(2) The elongated arm-bone of our animal, with its lack of a well-developed radial crest, shows that the arms of *Struthiomimus* were not used for struggling with an opponent nor for holding live prey, nor for pulling, because all these movements demand flexion and adduction. In the hand all three persisting fingers are of equal length, and the thumb could easily be opposed to the second and third finger. During the closing of the hand especially, the last phalanges could be strongly bent, and so it again becomes evident that

the claws of the opposed fingers could close without the basal parts of the fingers being brought together.

This structure of the manus is altogether different from the structure of the manus in the sloths, with which it has been compared, for these have no thumb; therefore its function was evidently different. Besides this, it differs also from the hand of climbing, branch-catching animals, for in these latter it is of importance that in order to augment the friction, the whole interior surface of the hand should be applied to the object it is grasping, and the base of the fingers more so than the points. Surely the fingers of *Struthiomimus* were adapted for holding something, but not for pressing. The hand of this animal seems admirably adapted for lifting objects from the ground that would be spoilt by pressing and that had no projections whereby they might be lifted, but were evenly rounded and smooth all over. By opening the long fingers, by pushing then the sharp claws of the second and third digit between such objects and the surface they were laying on and holding them with the thumbs, such objects might be surely and easily removed, even when of considerable weight or size.

By the hypothesis that *Struthiomimus* used while standing to lift objects from the ground, we get quite a satisfactory explanation for the great length of its arms, for these had to be in correlation with the strongly elongated hind legs that served for running.

(3) The edentulous maxillaries of *Struthiomimus* show that the maxillary was not used for the trituration or the crushing of the food, for if it crushed its food it is difficult to understand why its teeth should have been reduced. This militates against its having eaten crabs, crayfish, sea-urchins, or similar material. The sharp and pointed beak indicates that the food was of such nature that not comparatively blunt premaxillaries but a pincers-like object had to be brought into action, and the strong muscles of the lower jaw prove beyond doubt that the object that had to be cut out with the sharp end of the beak was resistant, and although not hard, yet tough, and perhaps even leathery. This powerful musculature is a strong argument against the hypothesis of *Struthiomimus* having taken the same sort of food as the living ostrich or of having lived on soft fruit, leaves, or insects. Probably it was not leathery material cut by the beak that served for food, for, firstly, the nutritive value of all such material is generally small, and, secondly, the maxillaries would again have been brought into action with something soft beneath. To assume that the soft part of the

food ran the risk of being spilt or spoilt if no clean hole was cut through the leathery covering does not seem hazardous. It is evident that premaxillary teeth never would be capable of cutting a neat hole in a leathery bag containing semifluid material.

(4) That the swallowing of some semifluid material was likely to be accompanied by a rapid fore-and-aft movement of the head is not at all surprising. As Osborn pointed out, the existence of such movements in *Struthiomimus* is rendered probable by the structure of the cervical vertebrae.

(5) Since remains of *Struthiomimus* occur frequently in seashore deposits, we can assume that it was frequently to be met with on sandy beaches, where it could rush along on the sand and avoid muddy regions.

Summing up, we may assume that *Struthiomimus* frequently found its food in the sand along the shore, uncovered it with its hind legs, lifted it with its hands, opened the leathery covering with the beak, and swallowed the semifluid contents, jerking its head while swallowing. So *Struthiomimus* seems to have been an egg-devouring Dinosaur of the very worst sort, frequently pursued by the animals whose nests he robbed.

That reptile eggs were abundant during all the Mesozoic period, and that they were also then especially abundant on dry and sandy beaches, is beyond doubt. As to the apparently curious feature of a carnivorous Dinosaur becoming adapted to the eating of eggs, this is paralleled in the Varanidæ and the snake *Dasypeltis*.

To convey to the general reader an idea of how *Struthiomimus* probably behaved when robbing a nest, a reconstruction is given herewith (p. 153).

London, March 1922.

XVI.—*A Case of Secondary Adaptation in a Tortoise.* By  
Baron FRANCIS NOPCSA, Foreign Corresp. Geol. Soc.  
London.

IN all tortoises possessing a well-developed plastron and no large mesoplastron, the middle elements—viz., hyoplastron and hypoplastron—are always at least as long as each of the terminal elements—viz., epiplastron (entoplastron) and xiphiplastron. Exceptions are only to be found in the Chelydridæ and Cino sternidæ. Sometimes, especially in

primitive Jurassic and Eocene groups (Plesiochelyidæ and Bænidæ), this difference is very marked.

Evidently the great cranio-caudal length of the middle elements of the plastron of tortoises represents the stage of development attained by all tortoises after suppression of the mesoplastron.

It is not without interest to investigate why the Cino-sternidæ make an exception to this rule, for within this group the median bony elements of the plastron show a very remarkable shortening. Among the Dermatemyidæ (as defined by Hay), apart from forms provided with a normal well-developed plastron, others also are to be met with where the plastron is more or less reduced (*Agomphus*, *Hoplochelys*, and *Baptemys tricarinata*). In these cases the reduction of the plastron acts in the first instance upon the middle elements, which become shortened to such an extent as to form a sort of cruciform plastron.

A perfectly cruciform plastron is to be met with in the family Chelydridæ and in *Staurotypus*. In these animals the middle elements of the plastron are much shortened on both sides, while the terminal elements (epiplastra and xiphi-plastra) show a cranio-caudal stretching, as if their distal parts had been fixed to something that prevented them from yielding to the shortening of the middle region. The shape of such a plastron is very much the same as that of a diamond-shaped piece of indiarubber that has become compressed on either side while it was fixed at its two ends. Since it is a well-known fact that in all primitive tortoises (Amphichelyidæ) and also in the Dermatemyidæ the scapular and pelvic arch adhere more strongly to the distal parts of the plastron than in all the other Cryptodira, this explains the cruciform shape.

I firmly believe that in all these primitive and relatively flat tortoises the scapular and pelvic arches formed internal pillars, whose functions were much the same as the great convexity of the shell in later terrestrial forms—namely, to protect the shell from being crushed.

Siebenrock demonstrated in the 'Sitzungsberichte' of the Vienna Academy in 1907 (pages 537-538) that all the Cino-sternidæ with strongly developed plastron (group *C. cruentatum*) originate with Cino-sternidæ where the plastron has the shape of a cross (group *C. odoratum*). To support his argument he mentions the existence of an entoplastron in *Staurotypus* and the existence of one or two flexible joints in the plastron of the group *C. cruentatum*. These observations

of Siebenrock show in a convincing manner that the enlargement of the plastron in the group *C. cruentatum* is due to a secondary process. The enlargement not being attainable by the growth of the middle elements, which were already undergoing a reduction in the primitive Cinosternidæ, the terminal elements were called upon in the course of evolution. This explains why they attain in the Cinosternidæ such an exceptional size. But not only the development, but also the articulations, in the plastron of the Cinosternidæ differ in regard to their position from the articulation in other forms. In all tortoises where flexibility of the plastron is developed, as in *Sternotherus*, *Terrapene*, *Cyclemys*, and *Ptychogaster*, the joint is situated on the posterior edge of the hyoplastron, while it is on the median suture of the four terminal elements in the Cinosternidæ.

This detail of minor importance is the reason why in all tortoises, except Cinosternidæ, only one part of the plastron (either the anterior or the posterior) becomes flexible, while in the Cinosternidæ both parts are movable.

The single group of tortoises in which the arrangement of the plastral elements might have permitted a double movement are those with a large mesoplastron (*Sternotherus*), but here, again, the coalescence of the pelvic girdle with the posterior plastral element prevents such specialization.

A curious trait worth mentioning is the fact that in all Cinosternidæ the development of the dermal scutes is in no way affected by the change in the underlying bones—so that in this group the dermal elements evidently represent conservative parts of the body.

XVII.—*Fossil Arthropods in the British Museum.*—VIII.  
*Homoptera from Gurnet Bay, Isle of Wight.* By T. D. A.  
COCKERELL, University of Colorado.

IN 'Annals Entomological Society of America,' 1917, p. 13, I estimated that the collections from the Oligocene of Gurnet Bay would yield at least 200 species. At the present moment, if we include the three species described below, the list stands at 154. Perhaps half-a-dozen others have been described and await publication. Having worked over the collections at the British Museum, including those sent by Mr. Hooley, I can affirm that the number of species will considerably

exceed 200, and may reach 250, or even possibly 300. The described species are distributed as follows:—

*Diptera*.—72 species, of which 31 are Tipulidæ. 5 genera extinct, out of a total of 44 genera.

*Hymenoptera*.—51 species. 10 genera extinct, out of a total of 40 genera. At least 1 additional ant has been set aside for Mr. Donisthorpe to describe. There are no bees.

*Homoptera*.—9 species. 4 genera extinct, out of a total of 9 genera.

*Odonata*.—4 species, of 4 genera, none extinct. The collection contains many more dragonflies, which will be described by Dr. Tillyard.

*Orthoptera*.—3 species of Gryllidæ, of 2 genera, none extinct. Other Orthoptera, some very fine, remain undescribed.

*Heteroptera*.—3 species, placed under two generic names, probably involving 1 or more extinct genera, but these not named. There are various species awaiting description.

*Neuroptera*.—2 species, of 2 living genera.

*Lepidoptera*.—2 species, of 2 extinct genera. Other Lepidoptera in the collection have been set aside for Mr. Durrant to describe.

*Isoptera*.—2 species of the Australian genus *Mastotermes*.

*Trichoptera*.—2 species of the living genus *Bereodes*.

*Mecoptera*.—1 species of the living genus *Panorpa*.

*Corrodentia*.—1 species of the living genus *Psocus*.

*Thysanoptera*.—1 species of the living genus *Aeolothrips*.

*Coleoptera*.—1 species of the living genus *Pterostichus*.

Very many other beetles await description.

The total number of extinct genera, as the records stand, is 21. It has seemed surprising that more were not found, since there are so many extinct genera in the later rocks of Florissant, Colorado. The discrepancy is no doubt largely to be explained by the fact that the greatest amount of generic differentiation occurs in those groups which depend on particular genera of plants, especially woody plants. These groups—*e. g.*, Homoptera, Lepidoptera, plant-feeding Coleoptera—have been neglected in the Gurnet Bay fauna, preference being naturally given to those insects which could readily be assigned to definite genera. The generic assignment of beetle-elytra and fragmentary remains of Hemiptera is hazardous, and doubly so when one is not well acquainted

with the very numerous existing genera. In due time, however, all these remains must be studied, and the recognizable ones described. When this is done, the Gurnet Bay list will doubtless show a greater proportion of extinct genera.

Many of the Gurnet Bay genera still live in Britain or in Europe, but those which do not are mainly to be sought in the Oriental or Australian regions.

## HOMOPTERA.

### Cercopidæ.

#### *Aphrophora* (?) *woodwardi*, sp. n. (Fig. 1.)

Tegmen 6 mm. long, blackish, with thick dark veins; markings and venation as shown in figure; the whole surface is minutely tuberculate or mammillate.

Oligocene of Gurnet Bay, Isle of Wight (Hooley, 619).

Fig. 1.



*Aphrophora woodwardi*, sp. n.

The clavus has become separated and lost. Dr. E. P. Van Duzee kindly examined my drawing, and suggested the reference to the vicinity of *Aphrophora*. The principal difference from modern *Aphrophora* is in the strongly bent media, which might justify a special generic name. The general appearance of the insect is suggestive of *Cercopis fasciata*, Heer, 1853, from the Miocene of Radoboj in Croatia. The name given by Heer is preoccupied by Fabricius, so the Croatian fossil may be called *Cercopis* (?) *heeri*, n. n. The fossil now described is dedicated to the author who first reported a Cercopid from the Gurnet Bay deposit, though he erroneously recorded it as the modern *Triecphora sanguinolenta*, which, according to Van Duzee, is the type of *Cercopis*.



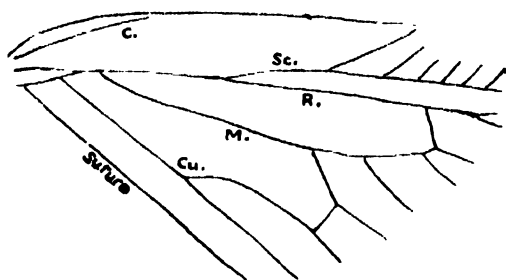
**Fulgoridæ (sens. lat.).****HOOLEYA, gen. nov.**

Represented by an imperfect tegmen, showing the following characters:—Broad, with costal margin straight except at base; a distinct costal vein; subcosta united with radius for some distance, separating at a very acute angle, and giving off at least six nearly parallel branches to costa; media with all four branches separate;  $m_4$  joined by a cross-vein to upper branch of cubitus.

*Hooleyia indecisa*, sp. n. (Fig. 2.)

Length of fragment (base to sixth branch of subcosta) 8 mm.; dark fuscous throughout, with dark veins.

Fig. 2.

*Hooleyia indecisa*, sp. n.

Oligocene of Gurnet Bay, Isle of Wight, 1886 (Hooley, 1145).

Mr. F. Muir, the well-known specialist in this group, was good enough to examine my drawing, and suggests that the insect may fall in the Derbidae, perhaps near to *Nesokaha*, Muir. The genus *Nesokaha* was based on a species from Ceram, but others occur in the Philippines, and there is one in Formosa. I had interpreted the insect as a member of the Cixiidae, and Mr. Muir considers this possible. In Tillyard's fossil *Triassocixius* there are similar oblique branches to the costa, but these are considered to come from the first division of the radius, the subcosta being supposedly absent.

**HASTITES, gen. nov.**

Tegmen elongate; subcosta united with radius for most of its length, terminating in two branches on costa; radius simple; media straight, not forked until far beyond middle of tegmen, a little beyond separation of subcosta from radius; upper branch of media forked, lower simple; cubitus with its upper branch forked.

*Hastites muiri*, sp. n. (Fig. 3.)

Tegmen about 5·5 mm. long, 1·8 wide; deep ferruginous as preserved, with black veins.

Fig. 3.

*Hastites muiri*, sp. n.

Oligocene of Gurnet Bay, Isle of Wight, 1891 (Hooley, 353).

Mr. Muir writes that he would place this in the Dictyophoridæ, near *Hasta* and *Thanatodictya*. These genera were founded by Kirkaldy in 1906 for Australian species.

**XVIII.—Papers on *Oriental Carabidæ*.—VIII.**

By H. E. ANDREWES.

ALL the species described in this paper were taken by Mr. E. A. D'Abreu in the Central Provinces, and nearly all of them at or near Nagpur. Some of them are not known as yet from any other locality, but others are apparently more widely spread, and three of them I took myself many years ago at Belgaum, in the south of the Bombay Presidency. Mr. D'Abreu has kindly allowed me to retain in my collection the types of such species as are not already represented in it.

**BEMBIDIINI.***Tachys comptus*, sp. n.

Length 2·5 mm. ; width 1·0 mm.

*Ann. & Mag. N. Hist.* Ser. 9. Vol. x.

11

Black, shiny ; prothorax with a faint reddish tinge, base, margin, and epipleuræ of elytra and sterna dark red ; joints 1-4 of antennæ, palpi, two spots on each elytron, and venter testaceous ; joints 5-11 of antennæ and legs flavescent.

*Head* convex and very smooth, labrum and clypeus truncate, frontal furrows simple, short, and shallow, eyes not very prominent, antennæ hardly reaching beyond base of prothorax. *Prothorax* very convex, smooth, a good deal wider than head, and half as wide again as long, equally contracted at extremities, but sides of base very oblique close to angles, so that the part of base in contact with elytra is narrower than apex, sides strongly and evenly rounded, hind angles projecting as a small, sharp, acute tooth ; median line very faint, foveæ small and rounded, quite close to angle, no carina, the shallow furrow inside basal border faintly crenulate. *Elytra* convex, ovate, half as wide again as prothorax, and as much longer than wide ; stria 8 deeply impressed, stria 1 moderately impressed, not nearly reaching base, no other striae visible, front dorsal pore near base, hind one at two-fifths from apex, recurved striole deep but not long ; testaceous spots fairly large, reaching nearly to the site of stria 2, vaguely margined with red, the front one more or less triangular, the hind one transverse, placed behind shoulder and at apical fourth respectively.

Not unlike *T. pæcilopterus*, Bates, but distinguished at once by the simple frontal furrows and the single sutural stria on the elytra. Darker and a little more elongate, the apical antennal joints very light ; prothorax more convex, sides more strongly rounded, hind angles acute and projecting ; front dorsal pore on elytra placed much further forward.

CENTRAL PROVINCES: Nagpur (*E. A. D'Abreu*), a dozen ex. CHOTA NAGPUR: Ranchi (*W. H. Irvine*—Ind. Mus.), 1 ex. ASSAM: Mangaldai dist., Tezpur (*S. W. Kemp*—Ind. Mus.), 1 ex.

## ODINI.

### MILTODES, gen. nov.

Ligula narrow, a little dilated at apex, bisetose ; paraglossæ wide, rounded, reaching far beyond it, but not enveloping it. Antennæ with joint 3 shorter than 4. Palpi subacuminate at apex, labials with joint 2 unisetose on inner margin. Mentum small, with a rather shallow sinus and a triangular tooth. Labrum trisetose, the outer pores much larger than the central one, which is very small. Prosternum

much hollowed out beneath, especially near hind angles. Base of ventral segments strongly crenulate, as in some species of *Craspedophorus*.

In other respects this genus agrees with *Oodes*, though its very small size, minute head, and chestnut colour give it a very distinct facies of its own.

*Miltodes granum*, sp. n.

Length 3·25 mm. ; width 1·6 mm.

Chestnut-brown, margin of elytra a little darker; antennæ, palpi, and legs more or less testaceous. Surface smooth, moderately shining, shagreened, and microscopically punctate.

*Head* extremely small (0·5 mm. wide), convex, clypeus with a seta on each side near front angle, suture very faint, with three or four ill-defined punctures along it, eyes rather large and prominent, antennæ reaching basal fourth of elytra. *Prothorax* moderately convex, three times as wide as head, and two-thirds as wide again as long, widest at base, strongly contracted to apex, base widely arcuate (convexity forwards), apex slightly emarginate, sides finely bordered and evenly rounded, hind angles a little less than right, but with the point rounded off; median line and hind transverse impression just visible, surface otherwise smooth and even. *Elytra* moderately convex, a shade narrower than prothorax, into which the base fits almost exactly, half as long again as wide, sides parallel, base finely bordered from shoulder to stria 3; striæ moderately impressed and finely punctate, none of them quite reaching either base or apex, or joining the adjacent striæ, scutellary striole short, stria 1 hardly reaching forward beyond its extremity, a large umbilicate pore at base of stria 2, intervals almost flat, 3 without setiferous pores. Prosternal process finely bordered and rounded at apex; metepisterna longer than wide; ventral surface strigose, chiefly in a longitudinal direction, segment 1 with a transverse sulcus. Legs slender and elongate.

I do not know of any species among the Oodini with which I can usefully compare this, but it can hardly be confused with any other Eastern species at present described. At the first glance it suggests one of the smaller species of the genus *Alphitobius* (Tenebrionidæ), but the resemblance is, of course, only a superficial one.

CENTRAL PROVINCES: Nagpur (*E. A. D'Abreu*), 1 ex., ♀, "under weeds."

## DRIMOSTOMINI.

*Cælostomus ruber*, sp. n.

Length 5·0–5·5 mm.; width 2·0–2·2 mm.

Dark red, elytra and metasternum a little lighter, joints 4–10 of antennæ and middle of venter darker, palpi testaceous. Surface moderately shiny and appearing rather greasy.

*Head* rather small, moderately convex behind, flat in front, sides strongly bordered, a distinct rounded angle at each front corner, frontal furrows rather short and deep, divergent behind, and uneven at bottom, eyes small and rather flat, antennæ incrassate towards the apex but hardly moniliform, reaching a little beyond base of prothorax, pubescent from middle of joint 4. *Prothorax* quadrate and rather flat, a good deal wider than head, a third as wide again as long, rather wider at base than apex, base truncate, apex slightly emarginate, sides very lightly rounded in front, and equally lightly sinuate before base, only slightly contracted behind, border very fine, a pore at hind angle, but no marginal setæ are visible on any of the specimens, hind angles projecting a little laterally and slightly acute; median line deep, reaching base but not apex, base depressed between foveæ, which are wide and deep, converging a little and pointed in front, reaching base behind, which—regarded vertically—is strongly bisinuate; surface nearly smooth, a few punctures near hind angles, and usually traces of puncturation or crenulation in the depressions and marginal channel. *Elytra* convex, short-ovate, rather pointed behind, where the margin is distinctly sinuate, three-quarters as wide again as prothorax, less than half as long again as wide, sides strongly contracted at base, an obtuse tooth projecting forwards at shoulder, basal border distinct; striæ shallow, deeper at apex, finely and closely punctate, stria 1 continued nearly to basal border, a large pore at base of 3, 1–2 and 7 deep to apex, 3–6 not reaching apex, intervals flat on disk, convex near apex, 8 wider near apex, with a series of very large umbilicate pores, widely interrupted at middle, surface smooth. *Underside* smooth along median line, coarsely punctate at sides, pro- and metasternum channelled, prosternal process with a large pore at apex, metasternum bordered between the meso-coxæ, metepisterna elongate, ventral segments crenulate at base, as in some species of *Craspedophorus*. *Legs* rather short, protibiæ with one or two minute spines near apex of outer margin, tarsal joints throughout short and small, joint

1 equalling 2 + 3, joints 1-2 in protarsi not obliquely dilated, nor are joints 1-3 enlarged in any of the specimens (from which I conclude that all are probably ♀ ♀).

CENTRAL PROVINCES: Nagpur (*E. A. D'Abreu*), 5 ex. (two at light).

I have dissected out the buccal organs, as also those of an example of *C. picipes*, MacL., and find them to be almost exactly alike, except that in the new species the spines on the inner margin of the maxillæ appear to be rather more numerous. Nevertheless, owing to the very different facies, I put the species into the genus *Cælostomus* with great hesitation, but before making a new genus I am inclined to await the discovery of ♂ specimens, which I hope Mr. D'Abreu may soon find. It differs from *C. picipes* chiefly in the different form of the prothorax, the very light striation of the elytra, the different form of the protarsi, and the greasy-looking surface. As far as the tarsi go, the species is more nearly related to *Drimostoma*, but I am inclined to think that that genus is hardly separable from *Cælostomus*.

#### ANCHOMENINI.

*Anchomenus indicus*, sp. n.

Length 7.0-7.5 mm.; width 2.6-3.0 mm.

Black, upper surface ænescent, elytra slightly iridescent; joint 1 of antennæ, side-margins of prothorax, extreme apex of elytra, and legs more or less red-brown, apex of palpi testaceous. Surface moderately shiny.

*Head* moderately convex, smooth, frontal foveæ short and shallow, clypeal suture fine but clear, eyes fairly prominent, antennæ rather thick, joints 1-3 glabrous, reaching basal fourth of elytra. *Prothorax* moderately convex, distinctly wider than head and a third as wide again as long, equally contracted at extremities, sides of base oblique, apex bordered, front angles rounded but projecting slightly forwards, sides rounded, bordered in front only, rather strongly reflexed, more widely so towards base, almost angulate at middle, no sinuation behind, hind angles very strongly rounded, the hind pore forming a distinct notch on the margin, front pore in the marginal channel at two-fifths from apex; median line rather fine, foveæ elongate, very deep close to base, diverging forwards, surface nearly smooth and rather dull. *Elytra* convex, ovate, rather pointed behind, base bisinuate, nearly two-thirds as wide again as prothorax, and as much longer than wide; rather finely but clearly striate, the striæ with fine close-set punctures, intervals nearly flat,

3 with three inconspicuous pores, surface smooth, a little more shiny than head and prothorax. Underside smooth, metepisterna elongate. Upper surface of tarsi with two grooves, separated by a fine ridge; on the protarsi the grooves are less impressed and visible only on joints 1-2.

Very similar in form to *A. chinensis*, Boh., but a good deal smaller and rather more elongate, the legs and base of antennæ darker. Head similar; prothorax less evenly rounded at sides, which are more reflexed behind, the angles a little more evident; elytra distinctly narrower, with less rounded sides, the punctured striæ exactly similar; tarsi furrowed in just the same way.

CENTRAL PROVINCES: Bhiwapur dist. and Seoni dist., Khawasa, 2000 ft. (*E. A. D'Abreu*), 2 ex., ♂ ♀. BOMBAY: Belgaum dist., Tudia (*H. E. Andrewes*), 1 ex., ♂.

#### GALERITINI.

*Planetes indicus*, sp. n.

Length 8.0-8.5 mm.; width 2.4-2.8 mm.

Black above, piceous beneath; joint 1 of antennæ, femora, and tibiæ light testaceous, rest of antennæ, palpi, clypeus, labrum, and tarsi a little darker. Pubescence rather long and conspicuous.

Head rather wide and moderately convex, surface shiny, coarsely punctate, more sparsely on disk, neck constricted, smooth behind, eyes rather prominent, hairy, antennæ thick, a fine dark engraved line along middle of each of the joints 5-11. *Prothorax* cordate, a little convex, not much wider than head and very little wider than long, contracted about equally at extremities, but widest at apical fourth, sides of base oblique, apex emarginate at middle, sides lightly rounded and gently sinuate behind, hind angles only a little more than right, a slight notch in front of them, where the hind setiferous pore is placed; median line, basal impression, and foveæ all moderately deep, surface moderately shiny, finely but not closely punctate, densely along base. *Elytra* flat, only a fourth as wide again as prothorax, in the form of a rectangular figure, half as long again as wide, with rounded corners, base emarginate, border sharply rounded at shoulder; costæ very fine, the primary ones hardly more noticeable than the secondaries, surface dull. Underside punctate, but shiny.

Evidently very near *P. immaculatus*, Schaum, the type of which I have not seen. I do not know whether either Bates

or Chaudoir had seen it, though both refer to the species. I have been able to examine the example so named by the former (Ann. Soc. Ent. Fr. 1889, p. 280), and I think his determination is correct. The new species is rather smaller and narrower; head more coarsely punctate; prothorax narrower, less rounded at sides, more coarsely punctate (though less so than head); elytra narrower, costæ a little narrower.

CENTRAL PROVINCES: Nagpur, 5 ex., Telinkheri, 1 ex. (*E. A. D'Abreu*).

### ZUPHIINI.

#### *Zuphium indicum*, sp. n.

Length 11·0 mm.; width 3·75 mm.

Ferruginous, underside, joint 1 of antennæ, and margins of prothorax darker, head, prothorax, and border of elytra red, elytra slaty-black. Pubescence extremely short and fine.

*Head* very convex behind, flat in front, surface very shiny, though finely punctate, more sparsely on disk, eyes small, genæ large and evenly rounded, antennæ slender, reaching fully to apex of elytra. *Prothorax* cordate, slightly convex, half as wide again as head and a shade longer than wide, a good deal more contracted behind than in front, sides gently rounded and sinuate at a short distance from base, front angles much rounded, hind angles slightly obtuse, reflexed, not very sharp; median line fine, a little depressed at extremities, foveæ elongate, curving outwards in front, surface very finely and closely punctate, confluent in the foveæ, moderately shiny. *Elytra* flat, with oblique, but distinct shoulders, sides very gently rounded, almost parallel, rather more than half as wide again as prothorax, and as much longer than wide; striæ (for the genus) rather deeply impressed, more faintly near apex, very finely and closely punctate, intervals flat, the odd ones almost imperceptibly raised, a large pore at base of stria 1, pores of marginal series, which is widely interrupted, very large, the marginal channel fairly wide, surface very finely and closely punctate, very glossy in appearance and consequently moderately shiny. Underside finely and nearly uniformly punctate, rather more shiny than upper surface.

Closely allied to *Z. formosum*, Bates, but easily distinguished by its immaculate elytra. Head less closely punctate and more shiny, front not depressed, antennæ with joint 1 much darker than the other joints; prothorax a little wider in



front, hind angles hardly projecting; elytra a little wider, the marginal channel wider, striae deeper, intervals flat, the surface more evenly punctate.

CENTRAL PROVINCES: Nagpur, 1000 ft. (*E. A. D'Abreu*), 5 ex.

*Zuphium d'abreui*, sp. n.

Length 7·5–8·0 mm.; width 2·75–3·0 mm.

Ferruginous (ventral surface and legs rather lighter), head, prothorax, border of elytra, suture near apex, and a shoulder-spot reddish, side-margins and base of prothorax, and elytra piceous-black. Pubescence short and fine.

*Head* convex behind, flat in front, rather sparsely punctate and very shiny, eyes of moderate size, genæ short, curving round sharply behind, antennæ hardly reaching apex of elytra. *Prothorax* cordate, slightly convex, a third as wide again as head, and hardly longer than wide, contracted more behind than in front, lightly rounded in front and sinuate at basal fifth, front angles rounded, but distinct, hind angles right, not very sharp, moderately reflexed and projecting a little laterally; median line very fine, the surrounding area slightly depressed, especially near base, foveæ short but fairly deep, surface finely and closely punctate, a little more coarsely in the foveæ, moderately shiny. *Elytra* flat, with oblique shoulders, sides parallel, two-thirds as wide again as prothorax, hardly more than half as long again as wide; striae extremely shallow and perceptible chiefly because the intervals are slightly convex, though faint punctures are visible here and there, the odd a very little more raised than the even, a small pore on each side of scutellum at base of stria 1, surface finely, closely, and uniformly punctate. The red spot covers the shoulder and extends backwards to a third from base, inwards to about stria 3. Surface moderately glossy. Underside very finely punctate.

Of nearly the same size and shape as *Z. erythrocephalum*, Chaud., but the shoulder-spot covers a more restricted area and there is no common apical spot. Head more sparsely punctate and consequently more shiny, eyes more prominent; prothorax a little less closely punctate and rather wider in front; elytra with shoulders more prominent, striae less evident, the puncturation less close and more even.

CENTRAL PROVINCES: Nagpur (*E. A. D'Abreu*), 4 ex. BOMBAY: Belgaum (*H. E. Andrewes*), 2 ex. Two of the Nagpur and one of the Belgaum examples were taken flying to light.

## MASOREINI.

*Ephnidius rubidus*, sp. n.

Length 4·0–4·75 mm.; width 1·5–2·0 mm.

Head, side and hind margins of prothorax, and underside piceous, middle of sterna and last ventral segment lighter; front of head, prothorax, and apical border of elytra dark red; elytra black; palpi, antennæ, and legs testaceous. Surface generally rather dull, very finely shagreened.

*Head* convex and very smooth, clypeal suture slightly curved, very faint, hardly visible at sides, eyes small and prominent, antennæ rather slender, reaching a little beyond base of prothorax. *Prothorax* moderately convex, half as wide again as head, and as much wider than long, base truncate, finely bordered (except at middle), apex emarginate, sides gently rounded and finely bordered, more contracted in front than behind, a seta before middle and another at hind angle, front angles slightly rounded but prominent, hind angles obtuse, but not much rounded; median line short and fine, impressions obsolete, the hind one just visible at middle, surface smooth and even. *Elytra* only slightly convex, of same width as prothorax and about two-thirds as long again as wide, base slightly emarginate, sides parallel, contracted close to shoulder; stria 1 sharply impressed (except close to base), the other striæ just visible and extremely finely punctate, intervals quite flat, 1 narrowing from base to apex, 3 without pores, marginal channel with few but large setiferous pores, a long pore on each side of scutellum; surface sericeous, but rather dull, quite without the mottled appearance of *A. adelioides*, MacL. Underside smooth and shiny, hind tarsi very long and slender.

A little smaller and narrower than *A. simplex*, Schm. Goeb., and otherwise coloured, the surface a little less dull. Head and prothorax very similar in form, latter with sides rather less rounded, elytra with more parallel sides, stria 1 more deeply impressed, the other inner striæ more effaced.

CENTRAL PROVINCES: Nagpur (*E. A. D'Abreu*), many ex. BOMBAY: Khandesh (*T. R. D. Bell*); Belgaum (*H. E. Andrewes*). MADRAS: Madura (*C. Somers-Smith*).

Some of the Nagpur specimens came to light. I took the Belgaum specimens during the two rainy seasons of 1886–7, nearly all near water.

XIX.—*New South African Species of the Genus Chlænius* (Carabidæ). By C. N. BARKER, F.E.S. (of the Durban Museum).

THE types of these five species are contained in the Durban Museum Collection. Co-types of *C. orbiculicollis* (a male) and of *C. cavilabrum* (a female) are retained in the collection of the donor, the Rev. J. A. O'Neil, of Salisbury, S. Rhodesia. The other three species are unique.

*Chlænius orbiculicollis*.

Length  $12\frac{1}{2}$  mm.; width 5 mm.

Briefly pubescent above, glabrous beneath; head and prothorax metallic greenish blue, shiny; elytra deep violaceous blue, less shiny, and with, on either side, a supra-apical orange subovate spot evenly rounded above, but a little irregular below, occupying intervals 4 to 7 inclusive. First three joints of antennæ and the palpi reddish testaceous, the remaining joints of antennæ black; labrum, mandibles basally, and margins of prothorax narrowly deep red. Legs testaceous yellow. Underside black, shiny, and iridescent.

*Head* short, broad, densely and evenly punctate, frontal foveæ subobsolete, transverse suture distinct; palpi: ♂ ♂ terminal joints all securiform, but maxillaries less widely; ♀ ♀ labials, securiform, maxillaries, short, explanate, and squarely truncate; antennæ: first three joints glabrous, the remainder pubescent and compressed.

*Prothorax* transverse ( $3\frac{1}{2} \times 3$ ), densely, deeply punctate, apex truncate, frontal angles declivous, rounded, and not produced, sides ampliate, nearly evenly rounded from apex to base, hind angles obtusely rounded, outer margins very narrowly reflexed, the groove within shallow, base and apex about equal in width, the former emarginate, disc convex, median line indistinct, broadly depressed, but hardly foveate on either side of base.

*Elytra* oblong-ovate, alike in both sexes, base about one-third wider than prothorax at base, shoulders broadly rounded, widely margined, gently amplified to beyond middle and rounded to, with the usual slight sinuation before, apex, a little convex above, briefly clothed with yellowish pubescence, deeply striate, intervals raised and a little carinate, densely and minutely punctate.

*Underside* glabrous, very shiny and iridescent, external parts remotely but deeply punctate; abdomen smooth, except for some superficial plications about lateral margins.

Nearly related to *C. marleyi*, Brkr., but a very distinct species. Comparing the two species "*orbiculicollis*" is more transverse; the prothorax is wider with the lateral margins more evenly rounded and there is no trace (though it is certainly very obscure in *marleyi*) of angulation near middle; the grooves within the reflexed margins are less deep, the hind angles are broadly rounded and not sinuately reflexed above. The head is shorter and broader, the puncturation stronger, and there is no smooth space on the vertex, the antennæ and palpi are less elongate, the coloration of the legs different, and the ♂♂ are not less ovate than the ♀♀, whereas in "*marleyi*" there is a considerable difference in this respect.

Described from one male and one female example.

*Hab.* Salisbury, S. Rhodesia. Collected by the Rev. J. A. O'Neil.

*Chlænium o'neili*, sp. n.

Length 15 mm.; width 6 mm.

Black; head and prothorax æneous, the former broadly suffused with metallic green frontally, the latter less conspicuously within the lateral margins; outer margins of prothorax, legs, labrum, mandibles, palpi, and three first joints of antennæ reddish testaceous, the remaining joints of the latter deep brown and pubescent.

*Head* plane, irregularly, remotely punctate with some inconspicuous plications posteriorly, frontal foveæ obsolete, represented by two impressions impinging on the clypeal suture; palpi short, terminal joints gradually widened to apex and abruptly truncated.

*Prothorax* transverse, one-fourth wider than long, apex truncate, angles very declivous and briefly rounded; borders at apex narrowly reflexed and grooved, the grooves gradually widening towards and becoming obsolescent above hind angles; sides gently amplify to near middle, thence straightly but with a slight upturned sinuation contracted to the obtuse posterior angles; base wider than apex, very shallowly emarginate medially, and with some rather long sparse pubescence basally and laterally; disc anteriorly very finely vermiculate, becoming denser towards base and sides; median line distinct from apex to base, and with a seriate row of punctures on either side of it; basal foveæ broad and deep, rugosely punctate, as well as base between and to angles.

*Elytra* oblong-ovate, sparsely pubescent, denser marginally, forming a band, a little wider than prothorax at

base, shoulders sloping, sides very gently rounded to and a very little sinuate immediately before apex; striæ fine, intervals hardly raised, densely and more or less confluent punctulate.

*Beneath* glabrous, very shiny, with a few shallow remote punctures about the sternal parts.

The short robust palpi with widened, squarely truncate apices of the terminals places this species with *fulvipes*, Chd., and *simplex*, Wied., in Bonelli's group *Dinodes*. It is, however, very distinct from these species. In size, shape, and also sculpture it is hardly distinguishable from *C. bipustulatus*, Boh., which has also similar palpi and male anterior tarsi.

The three basal joints of the tarsi are very transverse, the first broadly triangular, second and third quadrate, and each of them of nearly equal length and width.

Described from a single male example captured by the Rev. J. A. O'Neil, after whom I have the pleasure of naming it.

*Hab.* Salisbury, S. Rhodesia.

*Chlænius cavilabrum*, sp. n.

Length  $15\frac{1}{2}$ –16 mm.; width  $6$ – $6\frac{1}{2}$  mm.

Briefly pubescent; head and prothorax metallic green, the latter narrowly margined with red, and with the larger portion of the disc in centre and to base suffused with coppery bronze. Legs, labrum, palpi, and three first joints of antennæ testaceous yellow, the remaining joints of latter darker and pubescent. Elytra dull æneous, more or less suffusedly greenish laterally; a yellow marginal band extends from shoulder to apex, occupying the intervals to the eighth stria; below shoulder, for a short distance, it invades the interval, and at a point a little above the coalescence of the striæ posteriorly it is abruptly widened into an elongate patch occupying intervals 7, 6, and 5, and continues gradually attenuated to apex.

*Head*: sides and basal part coarsely irregularly punctate with finer punctures intermixed, front and vertex aciculate with a few remote punctures, neck smooth, frontal foveæ subobsolete, labrum short, smooth, truncate, with a broad saucer-like depression occupying the middle space; palpi elongate, cylindrical, the last joint a little shorter than the penultimate, the apices squarely truncated; antennæ long, filiform, setose, hardly compressed, three first joints glabrous, the remainder pubescent.

*Prothorax* transverse ( $4\frac{1}{2}$  mm.  $\times$   $3\frac{1}{2}$  mm.), a little wider at

base than at apex, front nearly straight, angles rounded and declivous, sides very gradually amplified to middle, thence obliquely and slightly contracted to hind angles, which are bluntly right, base broadly, shallowly emarginate, disc coarsely, somewhat remotely punctate about centre, more densely at apex and very densely about base and in the depressions, a little convex, declivous frontally, median line short, shallow, reaching neither apex nor base, lateral foveæ moderately deep but not reaching base, lateral margins narrowly reflexed.

*Elytra* hardly wider than prothorax at bases, scutellum smooth, shoulders sloping, briefly amplified below, thence for two-thirds the length a little explanate, and below rounded without sinuation to apex, striæ narrow, moderately deep, not or hardly perceptibly punctate, intervals very slightly raised, densely shagreened, and briefly pubescent.

*Underside* piceous red; shiny, remote setose punctures on all the sternal parts, venter smooth impunctate, margins of prosternal process carinate.

This species has a very distinctive feature in the labrum, which, in each of the three female examples before me, has a conspicuous circular saucer-like depression which occupies the greater part of the middle space.

Like "*senegalensis*, Gory," "*cavilabrum*" is pubescent and similarly patterned, but both the author and Lacordaire place that species in the subgenus *Epomis* next to "*E. capensis*, Chd." If this be its correct position, "*cavilabrum*" is widely separated from it by the shape of its palpi, which are long and cylindrical like those of "*capicola*" and "*mendax*" of Chaudoir.

It is also considerably smaller than "*senegalensis*," and, judging by the description, for I have not seen the species, the prothorax is much wider at base.

Described from three female examples.

*Hab.* Salisbury (2) and Umtali, S. Rhodesia. Received from the Rev. J. A. O'Neil.

*Chlænus (Epomis) alternatus*, sp. n.

Length 17 mm.; width 7 mm.

Head and prothorax coppery, with green reflections in strong light about margins; elytra opaque æneous, merging into coppery metallic about base and sides, outer margins to the eighth striæ bordered with bright metallic green. First three joints of antennæ, palpi, and legs deep testaceous yellow; remaining joints of antennæ black and pubescent, clypeus and mandibles reddish, piceous apically.

*Head* coriaceous, plicate-punctate on either side above eyes,

more regularly punctate posteriorly; frons and epistome with a shallow sulcation on either side; terminal joints of palpi gradually incrassate from bases and diagonally truncated; first three joints of antennæ smooth, with some spaced setæ on the upper side, joints beyond filiform, compressed, and pubescent.

*Prothorax* transverse (5 mm. by 4 mm.), densely rugose-punctate, about posterior margins and base the punctures more or less confluent, apex broadly emarginate, angles declivous, a little produced and rounded, sides very gently amplified to middle, then a little sinuately drawn in to base, which is about one-third wider than apex, hind angles obtuse, base sinuate on either side and conspicuously emarginate medially, disc a little convex, declivous frontally, median line narrow, reaching both apex and base, the lateral foveæ elongate and deep, but not quite reaching base.

*Elytra* oblong-ovate, at base very little wider than prothorax, bisinuate, humeral angles sharp, below amplified for a short distance and then very gently rounded to and hardly sinuate before apex, above a little convex, very declivous posteriorly, striæ closely punctate, the suture and alternate intervals a little more raised, all of them carinate and more or less regularly and finely seriate punctate in double lines.

*Underside* black, shiny, and a little iridescent, glabrous, but with some large superficial punctures on the prosternum and the metepisternal parts, and faint transverse aciculations on the sides of the venter.

Very distinct from any species known to me. The shape of the prothorax is similar to that of *C. cavilabrum*, mihii, a little more transverse and less declivous about sides of front. The elytra are also more ovate.

My only example is a female, but the labial palpi, though hardly securiform, are widely dilate and evidently entitle the species to be placed in or near the *Epomis* section.

The alternately raised elytral intervals, their seriate puncturation, and the bright metallic-green margins give the species some very striking characters.

*Hab.* Umtali, S. Rhodesia. Collected by A. Bodong, who (*teste* the Rev. J. A. O'Neil) had two examples in his possession, labelled *C. cupricollis*, a species I have no record of.

*Chlanius salisburyensis*, sp. n.

Length 12 mm.; width 5 mm.

Black, very shiny, apterous; head metallic green; prothorax purplish metallic with obscure greenish reflections

about disc, and more conspicuous within lateral margins; elytra very dark purple, less brightly metallic than prothorax, margins obscurely bluish green; base of mandibles, palpi, and two first joints of antennæ reddish testaceous, remaining joints of latter and the labrum piceous. Underside and legs (except the tarsi, which are dark red) black.

*Head* aciculate and with some faint plications and punctures on either side above and between the eyes, frontal foveæ and transverse suture obsolete, the carinæ bounding the frons prominently developed; labrum very short and emarginate; mandibles elongate and hardly arcuate. Antennæ subfiliform, short (reaching about one-fourth the length of elytra), first joint swollen, as long as third, joints above third compressed, and very gradually widening to seventh or eighth.

*Prothorax* trapeziform,  $3\frac{1}{4}$  mm. wide by  $2\frac{1}{2}$  mm. long, truncate at apex, angles hardly produced, rounded, depressed, sides gently explanate to middle, thence straight to posterior angles, which are bluntly right, base broadly emarginate medially, disc a little convex, median line well defined, not quite reaching either apex or base, lateral basal sulci elongate, reaching base, lateral margins within reflexed borders, deeply sulcate, the grooves widening out posteriorly, disc aciculate and with more or less seriate lines of remote punctures running longitudinally on either side of middle line, becoming less regular and sparser outwardly, except in the marginal grooves, median part of apex, lateral basal sulci, and the base itself densely aciculate punctate.

*Elytra* sordid, base bisinuate, hardly wider than prothorax at base, scutellum broadly triangular, humeral angles sharp, subdentate, a little amplified for a short distance below, sides parallel for two-thirds the length and gently rounded to and hardly sinuate before apex; a little convex above, striæ sulcate, punctate, intervals costate, nearly smooth, the eighth narrower, carinate, and the space between it and the outer margins rugosely punctate, the ninth stria not reaching shoulder, very sparsely pubescent about apex and posterior margins.

*Underside* glabrous, with remote shallow punctures on all the sternæ, some coarser punctures on the presternum; venter smooth, except for some rugosities about sides of base.

It agrees well with the characters given by Laferté for his genus *Æacus* (vide vol. i. page 222, 'Genera des Coléoptères,' Lacordaire), especially in the shape of the mentum, which is exactly as he describes it: "dent médiane du menton



petite *excavié tronquée au bout.*" Unfortunately, the author does not say whether his species is wingless or not. The species originally allocated to this genus, now relegated to the list of synonyms of *Chlœnius* are *C. carbonarius*, Dej., and *C. stygius*, Laferté, both from West Africa. As regards the abbreviated stria 9, which coalesces with the outer margin some distance below the shoulder, the same peculiarity occurs in *C. clarksoni*, mihi, which, though very different from "*salisburyensis*" in the shape of the mentum, has a facies on a larger, more robust scale, not unlike it, and it is also an apterous species. It appears best placed after *C. clarksoni*, mihi, or *C. cham*, Chd., and between them and the *Calathus*-like group of species, to which *C. piceus*, Chd., belongs. All these species are apparently wingless and approximate to the genus *Systolocranius*, Chaud., of the tribe Oodini.

*Hub.* Salisbury, S. Rhodesia. Collected by the Rev. J. A. O'Neil. A single female example.

I take this opportunity to correct some verbal errors which occurred in my paper on "New Species of *Carabidæ* from South Africa," which appeared in the January number of the Ann. & Mag. Nat. Hist.:—

#### ERRATA AND CORRIGENDA.

- P. 30, last line, for "extending" read "which extends."  
 P. 31, first line, for "below it" read "below the widening."  
 P. 37, under description of *Chlœnius durbanensis*, third line, after "pubescent" place a semicolon and after "beneath" eliminate comma.  
 P. 38, under description of *Chlœnius marleyi*, paragraph Prothorax, last two lines, for "with deep basal foveæ" read "with a deep basal fovea."  
 P. 47, under description of *Callistominus caffer*, Boh., second line, for "latter" read "former."

#### DR. WILLIAM CARRUTHERS.

WE greatly regret to announce the death of Dr. William Carruthers at the age of 93. Dr. Carruthers was for forty-five years connected with the 'Annals,' and was always of great help in conducting the Magazine.—Eds.

THE ANNALS  
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XX.—*On a Collection of Mammals from Chiromo and Cholo, Ruo, Nyasaland, made by Mr. Rodney C. Wood, with Field-notes by the Collector.* By P. S. KERSHAW.

(Published by permission of the Trustees of the British Museum.)

THIS interesting collection of beautifully prepared specimens is the result of the labours of some years, and adds very considerably to our knowledge of the distribution of the small mammals of the district. Practically all the collection was made at Chiromo and Cholo in the Shiré Valley, about 17° S., 35° E.

The fine series of Chiroptera call particularly for notice, there being no less than twenty-eight species represented, of which two are new to science. A third novelty is *Uromys woodi* from Cholo.

Mr. Wood's field-notes are distinguished by inverted commas.

1. *Galago (Otolicnus) moholi*, A. Smith.

♂. 5, 298. Cholo, Ruo.

After a comparison of all the material in the British Museum, I am of opinion that *G. mossambicus*, Pet., is identical with *G. moholi*. The type of the latter is much faded, but more recent specimens from the neighbourhood of

the type-locality are indistinguishable from B.M. specimens from Tette, the type-locality of *G. mossambicus*.

"Found throughout Nyasaland, but not very common except in the low country, where it lives in the dense thickets and is rarely seen. Also lives among the leaves of the Hyphæne-palm and feeds on its fruit. Said by natives to eat the gums which exude from various *Acacia*-trees. Also various other wild fruits and insects generally. Mang'anja name 'Changa.'"

2. *Epomophorus wahlbergi*, Sund.

♂. 20; ♀. 124, 196, 237. Chiromo.

3. *Epomophorus crypturus*, Pet.

♀. 447. Cholo.

4. *Taphozous mauritanus*, Geoff.

♀. 190. Chiromo.

♀. 446. Cholo.

"Have seen this bat resting on the stem of a large tree head downwards, holding with thumbs as well as hind feet. When disturbed by endeavouring to catch it with a net, it moved with astonishing rapidity in any direction, keeping body in same position. The legs and wings moved so rapidly as to be almost invisible to the eye, the movement at once reminding one of that of the local African flat spiders (Pedi-palpidæ) on walls in houses. Does not appear to be at all common."

5. *Nycteris capensis*, A. Smith.

♂. 58, 79, 146, 187, 243, 244; ♀. 78, 103, 152, 245. Chiromo.

Nos. 243 and 244 in the red phase.

6. *Nycteris hispida*, Schreb.

♂. 147, 148; ♀. 145. Chiromo.

"All the species of *Nycteris* appear to have much the same habits locally. Their chief haunt is the hollows of large trees in the forests, particularly the tree known locally by its native name 'njale,' a species of *Sterculia*, which

nearly always gets completely hollow for all the length of its trunk when very large and old. I have never examined one of these trees without finding numbers of *Nycteris* in it, and they appear to be extremely numerous in the low country up to 1000 or 2000 feet; but, so far, I have not managed to take them in the 'Highlands' of 3000 ft. and over. They also frequent hollow fallen trees, culverts, etc., but I have never found them in hollow palms, although I have examined hundreds of them. This is possibly because the latter are almost always tenanted by numbers of *Scotophilus*, *Mops*, etc. Occasionally found in the roofs of houses and deep holes in ground."

### 7. *Nycteris oriana*, sp. n.

♀. 57, 312. Chiromo.

A member of the *aethiopica* group, with long ears and tail, approaching *N. luteola*, Thos., in size.

The body is clothed with long soft hairs, a dirty white colour on the dorsal surface for the greater part of their length, tipped with brown, the general result being a light pinkish brown. The hairs of the ventral surface are ecru-drab throughout their length. The edge of the wing-membrane from the ankle for about 21 mm. is fringed with light-coloured hairs. The shape of the tragus is as that figured by Dobson in the 'Catalogue of Chiroptera' for *N. macrotis*.

*Type*. Female. B.M. no. 22. 4. 25. 3. Original number 312. Collected on June 7th, 1918, and presented by Mr. Rodney C. Wood.

*Type-locality*. Chiromo, Shiré Valley, Nyasaland.

Dimensions of the type:—

Forearm 53 mm.; head and body 67.5; tail 63; ear 33; thumb 15.2; third finger—metacarp. 44, 1st ph. 24, 2nd ph. 29; fourth finger—metacarp. 42.5, 1st ph. 16, 2nd ph. 15; fifth finger—metacarp. 45, 1st ph. 15, 2nd ph. 16.2; tibia 25; foot 11; tibia and foot (including claws) 37.

*Skull*: greatest length to tip of canine 22.3; zygomatic breadth 13.7; breadth of frontal shield 8.4; length of upper tooth-row 8.1; *p*<sub>1</sub> minute and internal to the tooth-row, not in it, as in *N. aethiopica* and *N. luteola*.

*N. oriana* does not appear to be nearly related to any of the species in the *aethiopica* group. In size it approaches *N. luteola*, Thos. (which Mr. Thomas now agrees should be elevated to specific rank), but differs widely from it in other respects, such as in the length of the fur (13 mm. in *oriana*,

9 in *luteola*), and in its colour and texture, the dimensions of body and skull, the heavier dentition, the position of *p*<sub>3</sub>, and the much larger frontal shield.

8. *Rhinolophus hildebrandti*, Pet.

♀. 151. Chiromo.

9. *Rhinolophus augur zambesiensis*, K. And.

♂. 197; ♀. 26, 144. Chiromo.

♂. 436. Cholo.

10. *Rhinolophus lobatus*, Pet.

♂. 27, 192, 195, 201, 392; ♀. 38, 123. Chiromo.

♀. 8. Ruo.

Nos. 8, 27, 38, 123, and 392 in the red phase.

"Generally found hanging from the roof in grass-roofed buildings, native huts, holes in ground, etc."

11. *Hipposideros caffer*, Sund.

♂. 54, 62, 171, 180, 221; ♀. 53, 59, 63, 64, 70, 82, 102, 105, 188, 194. Chiromo.

♀. 23. Chikonje, near Chiromo.

Nos. 171, 180, and 221 in the red phase.

"Same habits as *Rhinolophus*, greatly frequenting buildings, culverts, etc."

12. *Hipposideros ruber*, Noack.

♂. 179. Villa Bocage, Shiré River, P.E.A.

♀. 163. Chiromo.

Both in the red phase.

13. *Hipposideros commersoni marungensis*, Noack.

♂. 215, 222, 236; ♀. 155, 358, 361. Chiromo.

♀. 429. Cholo.

"When a large species of wild fig, known locally as 'mtundu'-tree, ripens its fruits all along the stems of its branches, these bats come around in hundreds, like swarms of fruit-bats, land on the tree and seize the fruits, fragments of

which are scattered by them all around, and are often carried to other trees near by, and pieces dropped there. The natives state that they eat the fruit, and call them by the same name as the true fruit-bats, i. e. 'mleme.' I wrote this to Mr. Oldfield Thomas, who replied that no *Hipposideros* was a fruit-eater. On examination of the figs I found that practically every fruit was attacked by a large weevil, the larvæ of which were inside the fruit. It is therefore probable that it is on these weevil larvæ that the bat is really feeding, and that they only seize the fruit to tear it apart to get the larvæ. But in certain cases the fruit is often chewed into a pulp, as I have found the remains of it in this condition everywhere around the trees. Native observation is nearly always unreliable, and just seeing the bats seizing the fruits would be sufficient for them to believe that they were feeding on them. While the bats are at the trees and dashing on and off the branches the air is filled with their rather musical piping note, and the speed at which they travel makes a great 'rush' of wings. At other times they are not at all in evidence, and I have never found them in any 'colony.'"

#### 14. *Myotis bocagei*, Pet.

♂. 219, 401; ♀. 175. Chiromo.

♂. 125, 128, 130; ♀. 126, 127, 129, 131. Tekerani, Ruo.

"Inhabits hollow trees in forest."

#### 15. *Myotis welwitschii*, Gray.

♂. 420. Cholo.

♀. 28. Chiromo.

There seems to be no doubt that *Vespertilio venustus*, Matsch., is a synonym of this species. The only difference was one of size. The forearm of the type of *welwitschii* is given in Dobson's Catalogue as measuring 52 mm. I find that in reality it measures 54. This measurement for *venustus* is given as 56.5. The two specimens now to hand measure 58.2 and 55 respectively, while another specimen in the B.M. collection from the Transvaal measures 54.

"Appears to be very uncommon."

#### 16. *Pipistrellus nanus*, Pet.

♂. 67, 72, 75, 153, 157, 172, 241, 242; ♀. 49, 50, 52, 66, 68, 69, 74, 76, 164, 183, 185, 186, 421, 439. Chiromo.

♂. 266, 329; ♀. 267, 268, 269, 330, 440, 441. Cholo.  
 "Very common everywhere, coming freely into houses.  
 Three examined contained two young each (21st Oct., 1917)."

17. *Glauconycteris variegatus papilio*, Thos.

♂. 120. Chiromo.  
 "Apparently very rare. This was the only one taken in  
 five years, on branch of tree in forest."

18. *Eptesicus megalurus*, Temm.

♂. 24. Chiromo.

19. *Eptesicus rendalli*, Thos.

♂. 200; ♀. 162, 384. Chiromo.

20. *Scotophilus nigrita dingani*, A. Smith.

♂. 48, 132, 137, 138, 139; ♀. 136, 300. Chiromo.  
 ♀. 310, 385 (skulls only).

No. 300 is without the usual yellow tinge on the under  
 surface, and has a rather smaller skull and shorter fur than  
 the other specimens. On the whole, it answers very well to  
 Peters's description of *S. planirostris*, which is found together  
 with *dingani* in Tette. I am treating the present specimen  
 as a young *dingani*, which probably *planirostris* will prove  
 to be.

21. *Scotophilus viridis*, Pet.

♂. 84, 85, 159, 160, 189, 191, 193, 380, 403; ♀. 381.  
 Chiromo.

22. *Scotophilus gigas*, Dobs.

♂. 83, 372 (skull only); ♀. 170. Chiromo.

♂. 239. Mtondo, Ruo.

Since this species was first described in 1875 no other  
 specimens have been added to the B.M. collection. The  
 type-locality is Lagos, so that this species, like *Eptesicus*  
*rendalli*, has a wide range.

"I have only found the genus *Scotophilus* in hollow or  
 large holes in *Hyphæne*-palms. The forest of the low

country round the Shiré River (Ruo and West Shiré districts), and also that round Lake Nyasa and the Upper Shiré River, is full of these Hyphæne-palms. In such places *Scotophilus* is very common, and as many as twelve or twenty are sometimes got out of one hollow palm, which they inhabit together with all species of the 'free-tailed' bats (*Chærophon*, *Tadarida*, *Mops*, etc.). I have never found them in any other species of tree, but they probably inhabit hollow *Borassus*-palms as well where these are found. They are often noticeable at dusk hawking cotton bollworm moths and other insects over cotton-fields cleared in this type of forest, where the hollow dead palms have been left standing, and in this way must do a lot of good.

"They appear slightly oily to the touch when alive, and have a somewhat characteristic odour."

23. *Scotæcus woodi*, Thos.

♂. 168, 173 (type); ♀. 167, 169, 230. Chiromo.

This species was described from this collection by Mr. Thomas in March 1917 (*Ann. & Mag. Nat. Hist.* (8) xix. p. 280).

"Only taken among the leaves of young low Hyphæne-palms in forest, where they appear to be moderately numerous, though rarely seen. Several may be taken together nestling down among the leaves."

24. *Scoteinus schlieffeni australis*, Thos. & Wrought.

♂. 150, 393, 398; ♀. 158, 181, 182, 184, 246, 397. Chiromo.

"In all cases taken in house in forest in the evening."

25. *Miniopterus natalensis*, A. Smith.

♂. 211, 305, 400; ♀. 399. Chiromo.

26. *Kerivoula lucia*, Hint.

♂. 438. Cholo.

"Taken in clump of bamboos in forest full of bamboos; not seen elsewhere."

27. *Mops midas*, Sund.

♂. 39, 216, 217, 374, 378; ♀. 375, 383. Chiromo.



28. *Mops angolensis*, Pet.

♂. 176, 177, 178. Villa Bocage, Shiré River, P.E.A.

♂. 357, 376, 382; ♀. 377. Chiromo.

♂. 21. Chikonje, Ruo.

29. *Chærephon limbatus*, Pet.

♂. 46, 81, 88, 100, 304; ♀. 32, 87, 89, 90, 91, 92, 101, 115, 202, 220. Chiromo.

"The same remarks made as regards *Scotophilus* apply entirely to *Mops* and the other genera of 'free-tailed' bats, they being generally found in hollow palm-trees. Great numbers sometimes congregate in one tree. But *Chærephon* is also found in buildings of brick with corrugated iron roofs, where they live on the rafters between the wood and iron in hundreds sometimes, and are a great pest, owing to the fearful mess and smell they make. They enter these roofs generally through the small space between the iron ridging and wall, and, where there are many ways in, appear in all cases to frequent only one. At dusk I have seen a stream of them come out of one of these holes with incredible rapidity, defeating the eye to watch them, and reminding one of the stream of pellets from a gun. They also hawk cotton boll-worm, and other than their obnoxious habit of inhabiting house-roofs (but apparently never grass-roofs), do much good in consequence. On rarer occasions I fancy *Mops* also inhabits house-roofs, but not nearly so commonly as *Chærephon*. All are very oily to the touch, and their smell is very characteristic and strong."

30. *Rhynchocyon cirnei*, Pet.

♂. 258; ♀. 287. Cholo.

♀. 229. Chiromo.

"Generally distributed throughout the country, but most common where there are big thickets of jungle, such as in the Ruo district. Native name 'Sakwimbala.'"

31. *Petrodromus tetradactylus*, Pet.

♂. 25, 96; ♀. 29, 108, 149. Chiromo.

♀. 251. Cholo.

"Native name 'Sakwi.'"

32. *Nasilio brachyrhynchus*, A. Smith.

♂. 122, 391; ♀. 95, 121, 143. Chiromo.

"Both *Rhynchocyon* and *Petrodromus* have the curious habit of striking the ground sharply with the tail, so as to produce a rapping sound, often quite loud. In the dense thickets it can be heard all day if one listens carefully for it. I have frequently sat and watched them doing this only a few yards from me, and often several will be doing it at the same time quite near each other, but taking absolutely no notice of each other. Sometimes one individual will stop and rap every few feet. They often appear to listen after it, but not always. It is possible that *Nasilio* does it also, but I have never seen it do so. It, however, seems to inhabit open forest much more than the other two genera, and in the long grass is not often seen. In the thickets inhabited by the others there is no grass, and only dead leaves and small plants, which enables them to be easily seen. They stop at each puff of wind, as if suspicious, and hold the head up in the air, with the curious mobile tip of the nose moving about testing the wind, and reminding one forcibly of an elephant's trunk doing the same.

"The natives hunt them for food, and catch them by placing long narrow basket-traps in their runs, when they are out of the thickets, and then driving them; whereupon they rush down the runways and dash blindly into the traps, forcing themselves more and more to the narrow ends, and thus being unable to get out.

"*Rhynchocyon* remains in the thickets much more strictly than *Petrodromus*.

"Native name 'Dhundu.'"

33. *Crocidura hirta*, Pet.

♂. 94, 98, 116, 204, 205, 206, 207 (juv.), 209, 210, 338, 389, 395; ♀. 44 (juv.), 45 (juv.), 47 (juv.), 99, 117 (juv.), 203, 208, 336. Chiromo.

"Very common in low country. Native name 'Sunkwe.'"

34. *Genetta rubiginosa*, Puch.

♂. 234 (juv.), 386. Chiromo.

"Quite common. Mang'anja name 'Mwiri.'"

35. *Herpestes (Calogale) melanurus zombæ*, Wrought.

♂. 174. Near Chiromo.

♀. 290. Cholo.

"Common throughout the country. Generally goes about singly. Native name 'Likongwe.'"

36. *Mungos mungo*, Gmel.= *Crossarchus fasciatus*, Desm.

♂. 56. Near Chiromo.

"Common in low country, where they go about in bands of ten to twenty or thirty, with much 'chirruping' all the time, while they scratch about and hunt for insects; sit up on hind legs and tail when they think danger is about, and then, at a shrill cry from one or other, all dart away to cover. Never seen singly. Easily tamed and good pets. Very fond of eggs. Often caught by natives in noose-traps baited with a piece of chicken. Native name 'Msulu.' I once saw a troop of six up a half-rotten tree full of holes and hollow inside, and all were just peeping out of the holes at me.

"One I kept as a pet was very fond of snakes. It had the usual curious mongoose method of breaking eggs by either grasping them in the front feet and then hurling them with great violence against a wall, or stone, or tree, after first raising them up in front of it to get a good throw, or else by merely flipping them from the ground. In both ways the mongoose stands with its back to the object and sends the eggs through the hind legs. Gets very annoyed if egg does not break easily. Can emit an appalling odour when alarmed. The adults are not so easily tamed. Note of annoyance or alarm much deeper than the usual 'chirrup.'"

37. *Heliosciurus mutabilis*, Pet.

♂. 104; ♀. 71, 80, 301. Chiromo.

"Common in the low country in dense thickets and jungles, where are very many tall great trees and much undergrowth, lianas, etc. They live in holes in the trees, and do not appear to wander far outside these thickets, feeding on nuts and fruits of the various trees therein. Native name 'Gologolo.'"

38. *Paraxerus palliatus*, Pet.

♀. 402. Ruo.

39. *Paraxerus cepapi sindi*, Thos. & Wrought.

♂. 118, 347, 348, 349. Chiromo.

♂. 119. Namulambo, near Chiromo.

"Only found in open forest-country, never in the thick jungles, particularly where the 'msania'-tree (mopani of Rhodesia), *Copaifera mopani*, abounds. In places they are very numerous, and sometimes many may be seen together rushing about among the low trees or on the ground. They do not often enter thick forests of this 'msania' tree, but remain in the open forest on the outskirts. Native name 'Tsinde.'"

40. *Taterona nyasæ shirensis*, Wrought.

♂. 154, 223, 231 ; ♀. 37, 109, 390. Chiromo.

♀. 254, 255, 425. Cholo.

♀. 22. Chikonje, Ruu.

"Very numerous everywhere, in both high and low country. Mang'anja name 'mbewa.' In some places it forms a staple article of diet among all tribes of natives, and is frequently seen in the markets exposed for sale, split open, and toasted on sticks, being sold in this condition, and much esteemed. A great garden pest."

41. *Dendromus whytei*, Wrought.

♂. 277, 302, 416, 417, 443, 445 ; ♀. 307, 367, 405, 408, 426. Cholo.

"Lives in grass-nests in small shrubs or long grass-stems, sometimes among the roots of tall standing grass. All the tree-mice are generalized by the natives under one name—'sonto.' Have often found their nests among the fruit of a bunch of bananas on the plant."

42. *Dendromus (Poemys) nyikæ*, Wrought.

♂. 285 ; ♀. 292. Cholo.

43. *Steatomys pratensis*, Pet.

♂. 65, 97, 110, 212, 213, 214, 218 ; ♀. 60, 77, 93. Chiromo.

♂. 247, 260 ; ♀. 278, 323, 324. Cholo.

♀. 318, 320. Makwira's, Ruu.

♂. 313. Mlanje Road, Ruu.

"Said by natives to make its own holes in the ground."

Mang'anja name 'Nsana.' Eaten by most natives, and said to be very fat and good. Also a garden pest. Common throughout the country."

44. *Grammomys surdaster*, Thos. & Wrought.

♂. 369; ♀. 224, 361. Chiromo.

♂. 296, 309, 442; ♀. 289, 297. Cholo.

"Makes small nests of a few blades of dry grass in holes in trees. A forest-dwelling genus. Have also found the nest in the bracts of a dry maize-cob on the plant, and also in small bushes."

45. *Grammomys ruddi*, Thos. & Wrought.

♂. 133, 140; ♀. 134, 135, 141, 142. Chiromo.

"Taken in hole at top of Hyphæne-palm. Also in grass-nests in trees, similar to *G. surdaster*."

"These two species are called 'sonto' by the Mang'anja, as well as all other tree-mice."

46. *Rattus rattus alexandrinus*, Geoff.

♂. 51, 356; ♀. 33, 41, 345. Chiromo.

♀. 282, 503. Cholo.

"Very common everywhere. Mang'anja name 'Khoswe.'"

47. *Rattus (Aethomys) namaquensis arborarius*, Pet.

♂. 365, 371, 396; ♀. 228, 370, 387. Chiromo.

"Taken in grass-nest in bush; in tall, hollow, dead Hyphæne-palm; on ground in forest; below some timber stacked in grass-shed."

48. *Rattus (Mastomys) coucha microdon*, Pet.

♂. 107, 112, 198, 342, 363; ♀. 61, 111, 113, 199, 233, 235, 314, 315, 340, 341, 346. Chiromo.

♂. 327, 328, 360, 422; ♀. 248, 291, 294, 325, 326, 437. Cholo.

♀. 317, 319. Makwira's, Ruo.

This subspecies averages larger than *coucha* proper, is browner—i. e., less grey,—has shorter fur, and a proportionately longer tail. There is, however, very great individual variation in this species.

"Makes holes in the ground, and often a grass-nest at the end of them. All species of *Rattus* are called 'Khoswe' by the Mang'anja, and are eaten by some, but others will not

touch them. They are bad house pests, nesting almost anywhere in houses, and doing great damage to foodstuffs, fabrics, etc. In the low country they are often badly infested with the larvæ of the 'mputsi'-fly (*Cordylobia* and *Auchmeromyia*)—myiasis,—chiefly in the feet, which I have seen swollen to a terrible size and suppurating, practically every rat killed in the house being attacked."

49. *Mus musculus*, Linn.

♂. 279, 283, 286, 424; ♀. 295. Cholo.

"Common everywhere in the highlands. Have not met with it in the lower country.

"Native name 'Tsibwi.' This is probably a Ngoni word, also used by the Mang'anja of Ruo district."

50. *Leggada bella marica*, Thos.

♂. 337. Chiromo.

♂. 293, 352, 353, 366, 406, 409, 411, 413, 423, 427;

♀. 351, 354, 412, 414, 415, 418, 419, 428. Cholo.

"Very common throughout the highlands, where it is found in holes in the ground and among refuse, particularly in native gardens and maize-fields, where it makes small nests of grass among the maize-stems and fallen grass. It is also very common in the open type of 'msuku' (*Uapaca kirki*) forest found all over the highlands of Nyasaland. It is said by the natives often to close the mouth of its burrow with small stones, and it stores grain in chambers in the burrow.

"Native name 'Pido.'"

51. *Cricetomys gambianus* subsp.

♂. 306, 308, 331; ♀. 332. No locality given. (Skulls only.)

"Lives in huge burrows often twenty yards or so in length near the banks of mountain-streams. Fairly common all over the highlands. Makes great depredations among the native maize-crops, storing up immense quantities of grain in chambers in its burrow. It is trapped by the natives with fall-traps of logs of wood, and is eaten by all tribes. Does not appear to exist in the low flat country of the Shire River, but only where there are hills. Given that factor, it is found at all elevations. Its place appears to be taken on the low plains by the cane-rat (*Thryonomys*).

"Native name 'Bwampini.'"

52. *Uranomys woodi*, Hint.

♀. 280 (type). Cholo.

This species was described from this collection by Mr. Hinton in April 1921 (Ann. & Mag. Nat. Hist. (9) vii. p. 369).

"Said never to make its own burrow, but to take those of other mice. The only specimen I managed to obtain was taken in the burrow of a mole-rat (*Heliohobius argenteocinereus*). I have also been shown holes at the base of *Uapaca*-trees among the roots said to be used by this mouse, but excavation brought none to light. A native told me that they did not burrow these holes, but lived among the decayed roots of the tree. This is very probable in the case of *Uapaca*-trees ('msuku'), as their roots are nearly always partially decayed. The species appears to be known, though not often taken, and this native name also includes other genera of mice, as is so often the case. I am inclined to think that they are rare everywhere, as, although I offered a large reward for more specimens, none were ever brought me.

"Native name 'Sakachenzi.'"

53. *Saccostomus campestris*, Pet.

♂. 30, 31, 34, 40, 42; ♀. 35, 36, 55, 316. Chiromo.

"Not found in the Cholo highlands at all, but only in the hot low country of the Shiré River plain, where it is very numerous. Common in the forest covering these plains, native gardens, and occasionally in holes below native huts; in this case there being an exit always some way outside, as well as one inside the hut. Greedily eaten by some natives, but not by all; apparently a question of individual taste, not tribal prejudice. Digs its own burrow.

"Native name 'Jugu.'"

54. *Acomys selousi*, de Wint.

♂. 321, 322, 410. Cholo.

♀. 339. Chiromo.

"I have taken this species in old ant-heaps (termite) on forested hills, and in holes generally. It also is said not to make its own burrows, but to use those of other mice. I find that the Mang'anja name for these spiny mice is also 'Sakachenzi,' and it is undoubtedly this species that is most commonly referred to under this name, *Uranomys woodi* being probably only called so for want of a better name, being not nearly so well known or so often seen."

55. *Pelomys fallax*, Pet.

♂. 114, 165, 166, 227; ♀. 350. Chiromo.

♂. 333, 355, 359; ♀. 334, 335. Cholo.

A subspecies—*P. f. insignatus*—which lacks the dorsal stripe has been described by Osgood from Fort Hill, North Nyasaland. The abundant material in the British Museum shows that the presence or absence of this stripe is not a constant character, both striped and stripeless specimens being found living side by side in many localities in Mashonaland and Nyasaland. In the present series no. 165 has a poorly defined stripe and nos. 350 and 334 show a faint trace of one. The others are stripeless.

"Numerous all over country. Taken in holes in ground, and also makes nests of grass in trash like fallen maize-stems or thick, long, dry grass.

"Native name 'Bvumbi.'"

56. *Lemniscomys griselda calidior*, Thos. & Wrought.

♂. 156, 232, 240, 311, 368; ♀. 362. Chiromo.

♂. 250, 262, 407; ♀. 281, 344, 444. Cholo.

"Numerous all over country. Taken in holes in ground in forest of all types.

"Names 'Mphera' and 'Mphoni.'"

57. *Otomys angoniensis*, Wrought.

♀. 284. Cholo.

"The only one taken was among grass in a clearing on a wooded hill not far from a stream. The natives say it lives near streams as a rule, and makes its nest among grass and vegetation on banks, but not in holes.

"Native name 'Thiri,' probably 'Chingoni.'"

58. *Graphiurus microtis*, Noack.

♂. 288, 432, 433, 434; ♀. 404, 430, 431, 435. Cholo.

♀. 238. Lilanje, Ruo.

♀. 379, 394. Chiromo.

"Dormice are common all over the country, especially where the 'msuku'-tree (*Uapaca kirki*) abounds. This tree is often hollow in places, or has large holes in it, where branches have fallen and the heart decayed, and it is in these places that their nests are found, at any height from the ground, made of dry leaves of any small-leaved tree, such as *Brachystegia* sp., which is also a characteristic tree of this 'msuku' forest. I have also noticed it living in the grass roofs of huts, or in holes among the pole and mud walls.



The natives have a curious idea, universally believed in this country, that it eats rats and drives them out of houses; so they are often placed in houses for that reason! Their name for it—'Kadianlamu'—means 'The little one who eats his brother-in-law.' Also taken in hollow dead palms in the forest in the low country."

59. *Heliophobius argenteo-cinereus*, Pet.

♂. 249, 259, 265, 270, 272, 273, 275; ♀. 252, 253, 256, 257, 261, 263, 264, 271, 274, 276. Cholo.

♂. 226; ♀. 225. Chikonje, near Chiromo.

"Apparently only exists where there are hills, at any altitude, but not on the Lower Shiré plains. Makes long burrows anything up to 20 yards long a few inches below surface, then deeper to about 2 to 3 feet, where the living chamber is made. Very common in the Cholo highlands. Rather sluggish in daylight, and apparently then quite blind, as they snap at things or nothing in a blind reasonless way. Natives handle them quite freely by picking them up by the hair on the nape of the neck or top of head, when they are quite helpless. Eaten by all tribes, except those Mohammedan ones who do not eat any of these things. Eats roots underground.

"Mang'anja name 'Nanfuko.'"

60. *Manis temmincki*, Smuts.

♂. 343. Masengere, near Chiromo.

"Taken walking along path in forest in daylight. When disturbed it rolled up into a ball, but after a few minutes unrolled and walked off again. This occurred any time it was put down. After a few times it took no notice of people around, but walked slowly about, only rolling up if touched. The gait was slow and on hind legs, only touching ground with the backs of the fore-claws occasionally, the tail steadying it when it stopped for a moment. Appears to feed exclusively on termites, and possibly some ants. The flesh is considered a great delicacy, and in the olden days was a chief's dish only.

"Mang'anja name 'Nkaka.'"

"In the foregoing the natives spoken about are the large Mang'anja tribe of the southern parts of Nyasaland, and particularly the Cholo highland and Shiré River lowland districts. All other natives of different tribes are strangers in these districts."

XXI. — *Results of the Oxford University Expedition to Spitsbergen, 1921.*—No. 14. *Diptera Nematocera.* By F. W. EDWARDS.

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THE Oxford University Expedition to Spitsbergen in 1921 brought back a very considerable collection of Nematocerous Diptera, almost entirely collected by Mr. C. S. Elton. At the request of Prof. E. B. Poulton the author undertook the examination of this most interesting collection, the major part of which is deposited in the collections of the Hope Department of the Oxford University Museum; except in the case of uniques, a representative set of each species has been presented by the Department to the British Museum.

The collection comprised over 700 specimens, representing 29 determinable species; the species were, however, very unequally represented, more than two-thirds of the whole collection appertaining to three species only (*Psectrocladius limbatellus*, *Ps. borealis*, and *Cricotopus glacialis*), while of several of the remainder only single specimens were present. As was to be expected, the majority of the species belong to the Chironomidæ, but a rather surprising feature was the complete absence of Tipulidæ (excluding *Trichocera*, which is now referred to the Anisopodidæ). Several species of Tipulidæ are abundant in arctic America, *Tipula besselsi* being recorded so far north as 82°; some might certainly have been expected in Spitzbergen.

The British Museum possesses a fairly extensive collection of Nematocerous Diptera from Iceland (25 species), and I made a comparison between this and the Spitsbergen and Bear Island collection. Much to my surprise, I found that there was only a single species (*Cricotopus basalis*) common to both. I also compared the 40 species of Spitsbergen Chironomidæ with the British Museum collection of about 400 species of British Chironomidæ. The only species which appeared to be certainly identical in the two collections were *Chironomus riparius* (Mg.), Goet., and *Psectrocladius limbatellus* (Holmgr.). To these should, perhaps, be added *Sciara præcox*, Mg., and *Trichocera hiemalis* (Deg.); the identity of these two, however, is not yet fully established.

The following are the only important papers dealing with the Nematocerous Diptera of Spitsbergen :—

1869. HOLMGREN, A. E. "Bidrag till Kännedomen om Beeren Eilands och Spetsbergens Insekt-fauna." K. Svensk. Vet.-Ak. Handl. Ann. & Mag. N. Hist. Ser. 9. Vol. x. 13

- viii. No. 5, pp. 36-56. [Revises and supersedes the earlier work of Boheman]
1911. KIEFFER, J. J. "Land-Anthropoden von der Bären-Insel und Spitzbergen, gesammelt in den Jahren 1907 und 1908. Chironomide." In: KÖNIG, A. *Avifauna Spitzbergensis*. Bonn, 1911.
1919. KIEFFER, J. J., and THIENEMANN, A. "Chironomiden, gesammelt von Dr. A. Koch (Münster i. W.) auf den Lofoten, der Bäreninsel und Spitzbergen." *Ent. Mitt.* Berlin, viii. pp. 38-48, 110-124.

The following list includes all the Nematocerous Diptera which have hitherto been recorded from Bear Island and Spitsbergen, and notes also such of these species as have been recorded also from other parts of the Arctic region, the following abbreviations being used: B, Bear Island; S, Spitsbergen and adjacent islands; J, Jan Mayen; I, Iceland; G, Greenland; N, Nova Zemlya; L, Lapland. Allowing for probable synonymy (as indicated subsequently in the text) the list comprises 54 species, 29 of which (marked \*) are represented in the Oxford University collection. Of these 29 species, 9 (marked †) are recorded from the islands for the first time, 6 of these 9 being described as new. It is highly probable that, when the North-European Chironomid fauna is more precisely known, some of the species described by me, and also by Kieffer and Holmgren, from Bear Island and Spitsbergen, will prove to be identical with European forms, but in the present unsatisfactory state of our knowledge of these flies the identity can only be established in a few cases. I have not attempted to study all the very numerous descriptions of Palearctic species published by Kieffer, and it is therefore possible that some of my supposed new species may be found among these.

It will be seen from the list below that of the 55 species recorded, 35 are known from Spitsbergen but not from Bear Island, 15 from Bear Island but not from Spitsbergen, and only the remaining 5 from both places. The wide differences which these figures seem to indicate between the faunas of the two regions would no doubt become very much less apparent by further collecting in both areas. Since some species (*Sciara tridentata* and *Aedes alpinus*) are known from Spitsbergen and Greenland, it seems very probable that they (and other Spitsbergen species) will eventually be found on Bear Island also:—

## Sciaridae.

- \* *Sciara tridentata*, Rübs. S., J., G.
- *arctica*, Holmgren. S.
- *parva*, Holmgren. S.
- *ecalcavata*, Holmgren. S.
- *frigida*, Holmgren. S.
- \* — *pallidiventris*, Holmgren. S.
- *consimilis*, Holmgren. S.
- *abbrevinervis*, Holmgren. S.
- †\* — ? *præcox*, Mg. B.

## Mycetophilidae.

- Boletina maculata*, Holmgren. S.
- Cælosia* ? *setipennis* (Holmgren) (*Boletina*). S.
- \* *Erechia frigida* (Holmgren) (*Mycetophila*). S., B., J., ? G.

## Chironomidae.

- †\* *Chironomus riparius*, Mg. S.
- \* — *lugubris*, Zett. S., L.
- \* *Lauterbornia* ? *coracina* (Zett.). B., L.
- *Tanytarsus mimulus* (Holmgren). B.
- *Smittia brevipennis*, Holmgren. S.
- *Camptocladius stercorarius* (Deg.) (*byssinus*, Schrank). S., L.
- †\* — *oxonianus*, sp. n. B.
- \* — *curvinervis*, var. *polaris* (Kieff.) (*Trichocladius*). S.
- *spitzbergensis* (Kieff.) (*Trichocladius*). S.
- †\* — *longicosta*, sp. n. B.
- *flexinervis* (Kieff.) (*Trichocladius*). B.
- \* — *extremus* (Holmgren). S.
- \* — *pumilio* (Holmgren). S.
- †\* — *eloni*, sp. n. B.
- \* *Psectrocladius borealis*, Kieff. S.
- \* — *limbatellus* (Holmgren). S.
- *Dactylocladius subpilosus*, Kieff. B.
- *heptameris*, Kieff. S.
- *spitzbergensis*, Kieff. S.
- *petraeus*, var. *ursinus*, Kieff. B.
- ? *mixtus* (Holmgren). B.
- \* *Orthocladius consobrinus* (Holmgren). S., B.
- \* — *conformis* (Holmgren). S.
- *obscuripennis* (Holmgren). S.
- \* — *festivus* (Holmgren). S., B.
- \* — *decoratus* (Holmgren). S.
- *arcticus*, Kieffer. S.
- †\* *Cricotopus glacialis*, sp. n. S.
- \* — *basalis* (Staeg.). S., B., J., G., I.
- *Metriocnemus obscuripes* (Holmgren) (? *cataractarum*, Kieff.).
- \* — *ursinus* (Holmgren). S., B.
- \* — *brevinervis* (Holmgren). S.

\* Represented in Oxford University Collection.

† New record for the islands.

- Diamesa arctica*, Holmgren. S.  
 — *lundstruemi*, Kieffer (*arctica*, Kieff., 1911, nec II.). S.  
 †\* — *poulloni*, sp. n. S., N.  
 †\* — *septima*, sp. n. B.  
 \* — (*Adiamesa*) *hyperborea*, Holmgren. B.  
 \* — (—) *ursus*, Kieffer. B.  
*Psilodiamesa spitzbergensis*, Kieffer. S.  
*Tanyptus frigidus*, Holmgren. B.

#### Culicidæ.

- \* *Aedes alpinus* (L.) (*Culex nigripes*, Zett.). S., G., L.

#### Anisopodidæ.

- †\* *Trichocera lutea*, Becher. B., J.  
 — ? *hiemalis* (Deg.). S.

#### Sciaridæ.

The collection contains 10 specimens of *Sciara*, representing 6 or 7 species—of these 3 or 4 are represented by single more or less damaged examples, of which it need only be said that they do not appear to belong to any of the species described by Holmgren. Little can be done with such specimens until the Palæarctic species have been dealt with as a whole by modern methods.

The three remaining species are the following:—

#### *Sciara tridentata*, Rubs.

Synonyms: *S. atrata*, Holmgren, nec Say; *S. holmgreni*, Jacobs; *S. validicornis*, Lundbeck. The names *tridentata*, *holmgreni*, and *validicornis* were all proposed in 1898: I do not know in what order, but use the one under which the species has been redescribed by Johannson.

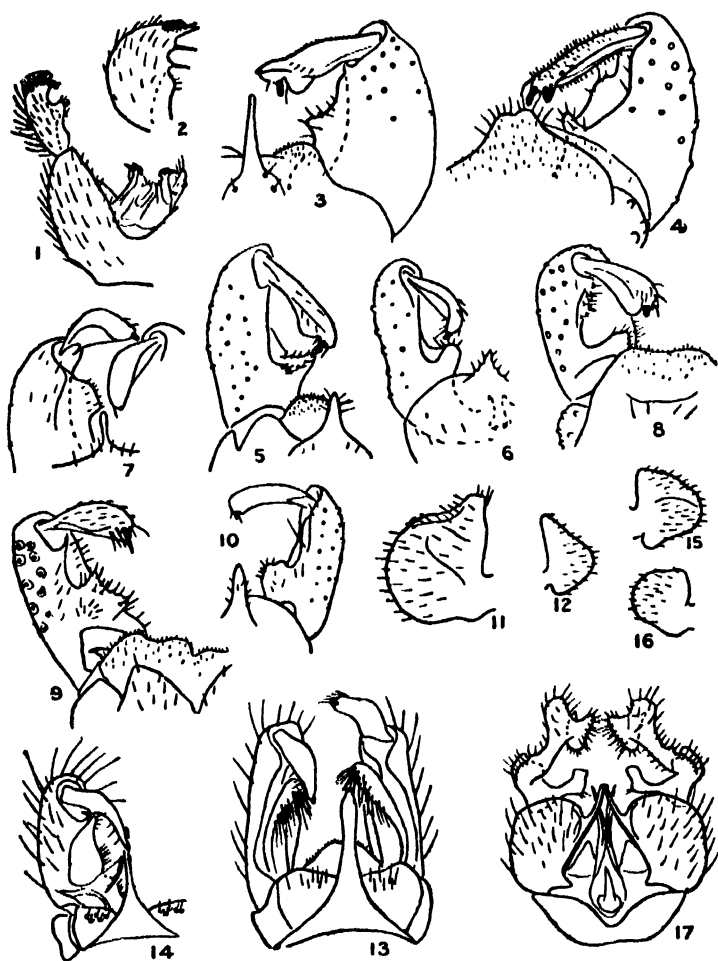
PRINCE CHARLES' FORELAND: Pt. Carmichael, Freshwater Bay district, N.E. of island, 4. vii. 1921, c. 40 ft., on stone of shingly raised beach; 1 ♂.

The specimen agrees sufficiently well with Holmgren's description of *S. atrata*, so that I have no doubt concerning the synonymy indicated above. The peculiar structure of the male claspers makes the species an easy one to recognise. Hypopygium, fig. 1 (p. 197).

#### *Sciara pallidiventrīs*, Holmgren.

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 22. vii. 1921; 0–50 ft., on shingly raised beach with *Dryas*; 2 ♂.

The male claspers (fig. 2) are constructed somewhat as in *S. mutua*, Joh., to which the present species appears to be closely allied.



1. *Sciara tridentata*, Rubs., hypopygium from below. 2. *Sciara pallidiventris*, Holmgren, ♂ clasper. 3-10, hypopygium from above, of: (3) *Camptocladius extremus*, Holmgren; (4) *C. eltoni*, sp. n.; (5) *Orthocladius consobrinus*, Holmgren; (6) *O. festivus*, Holmgren; (7) *O. conformis*, Holmgren; (8) *Cricotopus glacialis*, sp. n.; (9) *C. basalis*, Staeg.; (10) *Metriocnemus brevinervis*, Holmgren. 11. *Diamesa urus*, Kieff., ♀ lamella. 12. *D. hyperborea*, Holmgren, ♀ lamella. 13. *D. arctica*, Boheman, hypopygium from above. 14. *D. poultoni*, sp. n., hypopygium from above. 15. *D. poultoni*, ♀ lamella. 16. *D. septima*, sp. n., ♀ lamella. 17. *Trichocera lutea*, Becher, hypopygium from below. (Various magnifications.)

*Sciara ? præcox*, Mg.

BEAR ISLAND: Walrus Bay, S.E., 15. vi. 1921; c. 20 ft., on bare rock; 1 ♂.

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 22. vii. 1921; 0-50 ft., on shingly raised beach with *Dryas*; 1 ♂, 1 ♀.

The specimens agree with Winnertz's description of this European species.

**Mycetophilidæ.***Ecechia frigida* (Bohem.).

Synonyms: *Mycetophila frigida*, Boheman, Holmgren; *Parexechia concolor*, Becher; ? *Ecechia casta*, Johannsen. Probably also the species recorded by Lundbeck from Greenland as *Ecechia fungorum*.

BEAR ISLAND: Walrus Bay, S.W., 22. vi. 1921; c. 20 ft., under walrus-bones on moss; 5 ♂, 1 ♀. Walrus Bay, S.E., 22. vi. 1921; 20-50 ft., shaly slope,  $\frac{1}{4}$  mile inland, under stones; 1 ♂, 2 ♀.

SPITSBERGEN: Bruce City, head of Klaas Billen Bay; 0-50 ft., flying over shingle with tundra and ponds; 1 ♂.

The structure of the hypopygium agrees more closely with that of *E. casta*, Joh., than with that of any European species which has been figured, and the two are probably specifically identical, though, according to Johannsen's description, the American form is brown and not black.

**Chironomidæ.**

The great majority of the specimens in the collection belong to this family. All the species represented belong to the subfamily Chironominæ, in which (following Thienemann, Malloch, and Goetghebuer) I would include *Diamesa* and its allies.

*Chironomus ? riparius*, Mg.

Synonyms: *C. riparius* (Mg.), Goetghebuer; *C. nigroviridis*, Macquart, of Verrall's collection; *C. kochianus*, Kieffer.

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 22. vii.-14. viii. 1921; round huts, on window-pane, and on shingle of raised beach; 4 ♂, 8 ♀.

The structure of the hypopygium agrees well with Goetghebuer's and Kieffer's figures. The first segment of the front tarsus of the male has a short and inconspicuous beard, the longest hairs being about twice as long as the

diameter of the segment. In spite of Goetghebuer's statement that his identification of *C. riparius* was based on an examination by Séguy of specimens in the Paris Museum, I feel some doubt whether this is really the species which Meigen intended to designate as *C. riparius*, since in Britain I find that the commonest sea-shore *Chironomus* is a closely-allied species, which differs from the present one obviously (though almost solely) in having a long though scanty beard on the outer side of the front tarsi of the male. Both species are very common in Britain, and I can see no difference between rather dark British examples of *C. nigro-viridis* and the Spitsbergen specimens. Kieffer's *C. kochianus*, from the Lofoten Is., may possibly be distinct, since he states that the first segment of the front tarsus is nearly twice as long as the tibia.

*Chironomus lugubris*, Zett.

Synonyms: *C. spitzbergensis*, Kieffer; ? *C. hyperboreus*, Holmgren, nec Staeg.; ? *C. polaris*, Boheman.

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 19-22. vii. 1921; round huts, on shingle of raised beach, and on flowers of *Dryas octopetala*; 2 ♂, 6 ♀. Liefde Bay, 8. vii. 1921; coast tundra, 1 ♂ (*T. G. Longstaff*). Cape Boheman, N. side of Ice Fjord, 12. vii. 1921; flying over strip of marsh-land; 4 ♂, 1 ♀.

This is almost, if not quite, identical in structure with the preceding, and should perhaps be regarded as merely a black variety of it. The specimens agree with Zetterstedt's description, and the females with Kieffer's description and figure, except that the fourth palpal segment is not quite so long as described. Holmgren's description of *C. hyperboreus* also agrees, with the seemingly important exception that he states that the cross-vein is not infuscated. I think, however, there can be little doubt that Holmgren accidentally transposed his statements regarding the cross-vein of *C. hyperboreus* and *C. polaris*, and that having done so he placed them under the wrong headings.

*Lauterbornia ? coracina*, Zett.

Synonyms: *Chironomus coracinus*, Zett.; *C. polaris*, Holmgren, nec Kirby; ? *Prochironomus koenigi*, Kieffer.

BEAR ISLAND: S.W. of island, 17. vi. 1921; flying over bare rock near tarns 4 and 5; 11 ♂, 5 ♀. Inland from S. coast, 15. vi. 1921; flying over mound green with vegetation; 15 ♂, 3 ♀. Walrus Bay, S.E. of island, 0-100 ft., under stone; 1 ♂.



The species varies considerably in size, the smallest female measuring only 2.5 mm., and the largest male 6 mm. in body-length. The species may be readily distinguished by the very long and dense hair on the posterior legs and on the front tarsi of the male, and by the short, pale, and almost horizontal cross-vein. Zetterstedt's description of *C. coracinus* (from Central Sweden) applies in all respects to our insect, though the determination is not adopted with confidence, since in Kieffer's redescription of *C. (Lauterbornia) coracina* from Germany he states that small pulvilli are present, whereas in the Bear Island insect there is certainly no trace of pulvilli. There can be hardly a doubt that this is the species described by Holmgren as *C. polaris*, in spite of the fact (mentioned above) that he states that the cross-vein is infuscated. Kirby's original description of *C. polaris* is quite indeterminate, and the type is lost, but the British Museum possesses the remnants of one of the females on which Curtis founded his redescription and figure; this specimen is not a *Lauterbornia* but a *Chironomus*, related to, though quite distinct from, *C. lugubris*. Kieffer's *Prochironomus koenigi* must surely be *L. coracina*, though he states that the cross-vein is "schräg," and does not mention the front tarsi, nor the few fine hairs at the extreme tip of the wing, nor the ventral brush-like appendage of the male hypopygium characterizing the *Tanytarsus* group, to which *Lauterbornia* belongs.

#### CAMPTOCLADIUS, v. d. Wulp.

I agree with Goetghebuer in including within this genus the species with small pulvilli (*C. stercorarius*\* and some others); those with shortly hairy eyes (*C. aterrimus*, Mg., and its allies—i.e., Kieffer's genus *Phænocladius*); and those with microscopically setose wings, the setæ 2–4  $\mu$  in length (*C. minimus*, Mg., and its allies—i.e., part at least of Kieffer's genus *Chaetocladius* and Thienemann's genus *Dyscamptocladius*). Thienemann has shown that there are marked larval and pupal differences between these groups, but after studying about 30 British species I doubt if they can be maintained as distinct genera, owing to the occurrence of intergradient adult forms. It is, indeed, very difficult to draw a sharp line between *Camptocladius* and some other of the Orthocladariæ, especially *Dactylocladius*. The genus *Camptocladius* will, however, conveniently include all the

\* Syn. *Chironomus stercorarius*, Degeer, nec auct.; *C. hyssinus*, Schrank; *Psectrocladius foliaceus*, Kieff.

small species with a markedly sinuous vein  $Cu_2$ , with the base of the fork well beyond the cross-vein and without macrotrichia on the wing-membrane.

*Camptocladius longicosta*, sp. n.

BEAR ISLAND: Walrus Bay, S.E. of island, 14 & 22. vi. 1921; 20–50 ft., under stones in limestone gully quarter mile inland, and at flowers of *Saxifraga oppositifolia*; 14 ♀.

♀. Entirely black, including the pleuræ and halteres; head and thorax slightly dusted with grey. Eyes entire, distinctly and rather densely hairy. Palpi with the last three segments subequal, the terminal only slightly longer than the penultimate, and not more than five or six times as long as broad. Antennæ 6-segmented, segment 2 much constricted near the base, from the constriction outwards similar in shape to segments 3–5, which are somewhat flask-shaped, and about twice as long as broad; segment 6 not verticillate, not quite as long as segments 4 and 5 combined, with numerous short sense-bristles, especially on the apical half. Mesonotum without scales, and with only a few hairs between the slightly shining stripes. Lamellæ of ovipositor small, black, rounded, fringed posteriorly with short hair. Legs with moderately short pubescence. Last two tarsal segments subequal, the fifth very slightly longer than the fourth, which is about 2.5 times as long as broad. First segment of front tarsi a little over half as long as the tibiæ. Empodia about as long as the claws. Wings whitish, membrane bare, with a vacuolated appearance under a magnification of 80. Costa reaching almost to tip of the wing, and more than half the distance from the tip of  $R_4$  to that of  $M$ .  $R_1$  not quite half as long as  $R_4$ , which is approximated to the costa apically.  $R_2$  much nearer  $R_1$  than  $R_4$ . Base of fork of  $Cu$  distant from the base of  $M$  by nearly three times the length of the cross-vein. Anal lobe obtuse-angled, not well marked. Wing-length 2.3–2.8 mm.; body-length about 2 mm.

In many respects this seems to be very similar to Kieffer's *Trichocladius spitzbergensis*, but differs in the dark pleuræ, shorter palpi, and longer fourth tarsal segment. It is just possible that it may be the female of *C. flexinervis*, Kieff.

*Camptocladius curvinervis*, var. *polaris* (Kieffer).

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 14. viii. 1921; on hut window-pane; 1 ♀. Cape Boheman,

N. side of Ice Fjord, 12. vii. 1921; 0-40 ft., walking and flying by marshy edge of pond; 1 ♀.

The specimens agree well with Kieffer's description. The species is very similar to the preceding, but the cubital fork is longer—unusually long, in fact, for a *Camptocladius*.

*Camptocladius extremus* (Holmgren).

SPITSBERGEN: Gyps Valley, head of Ice Fjord, 26. vi. 1921; 100-200 ft., on slope, with *Dryas* and *Saxifraga*; 2 ♂, 2 ♀. Green Harbour, S. side of entrance to Ice Fjord, 28. vi. 1921; 0-100 ft., flying; 1 ♂.

PRINCE CHARLES' FORELAND: Pt. Carmichael, Freshwater Bay district, 4. vii. 1921; c. 40 ft., at flowers of *Saxifraga oppositifolia*, sandy zone of shingly raised beach; 2 ♂, 9 ♀; 30-80 ft., shaking *Dryas octopetala* on rock on hill; 1 ♀.

There is nothing in Holmgren's description but what would apply to this species. It belongs to the *aterrimus* group, with finely pubescent eyes (the pubescence more obvious in the ♂ than in the ♀, in which it is sometimes scarcely perceptible). Antennæ of ♂ with black plumes; last segment practically twice as long as the remaining flagellar segments together; first few flagellar segments swollen, transverse; remainder (except last) almost as long as broad. Antennæ of ♀ 6-segmented; segment 2 rather short, not constricted in the middle; segments 3-5 shortly oval; segment 6 about half as long again as segment 5; sense-bristles narrow and rather long. Hypopygium as in fig. 3 (p. 197). Costa moderately produced beyond the tip of  $R_1$ , ending well before the wing-tip.

*Camptocladius pumilio* (Holmgren).

SPITSBERGEN: Bruce City, head of Klaas Billen Bay; 19-22. vii. 1921; round huts, on shingly raised beach; 3 ♀. Advent Bay, S. side of Ice Fjord, 18. vii. 1921; on flowers of *Dryas octopetala* and *Cerastium alpinum*; 1 ♀.

Belongs to the *minimus* group; Holmgren's mention of the somewhat shining mesonotum indicates this. The specimens are in poor condition, but I cannot detect any trace of mesonotal scales; the second to fifth antennal segments are very little longer than broad; the fourth tarsal segment on all the legs is distinctly shorter than the fifth, though not quite so short as in the following species.

*Camptocladius eltoni*, sp. n.

BEAR ISLAND: near tarn 4, S.W. of island, 17. vi. 1921; on bare rock, c. 50 ft.; 3 ♂, 1 ♀. Walrus Bay, S.E. of island, 22. vi. 1921; c. 20 ft., on stones and walking on edge of wet moss tundra, 6 ♂, 3 ♀.

Wholly black; thorax somewhat shining. Eyes small, bare, entire, and very widely separated. Palpi long. Antennæ of ♂ 13-segmented, first three flagellar segments rather swollen and somewhat broader than long; penultimate segment about half as long again as broad; terminal segment about two-thirds as long as segments 2-12 together. Antennæ of ♀ 6-segmented; segments 2 and 3 nearly globular; 4 and 5 oval; 6 pointed, rather longer than 4 and 5 together, without sense-bristles, but with a whorl of long hairs close to the base, a slight constriction beyond this; sense-bristles on 3-5 short and slender. Mesonotum with small, black, lanceolate scales mixed with the long hairs; the scales with short stems and short sharp points, the broad portions occupying rather more than half their length. ♂ hypopygium (fig. 4): ninth tergite with a small central terminal emargination, no trace of a long point; side-pieces with a double lobe on the inner side, the basal part of the lobe finger-like, the apical part broad and rounded; clasper not enlarged, with a moderately long spine which almost continues the direction of the longitudinal axis, and a short, rather sharp, and somewhat curved terminal point internal to the spine. Lamellæ of ♀ rather short, without long hairs. Legs without long hairs (♂ ♀), the longest being hardly longer than the diameter of the segment bearing them; spur of front tibiæ somewhat longer (♂), or distinctly shorter (♀), than the tibial diameter. Fourth tarsal segment on all the legs (♂ ♀) about two-thirds as long as the fifth. Empodium as long as the claws. Wings slightly greyish, finely punctate under a magnification of 80, covered with minute setæ visible only under a magnification of 300. Costa reaching about one-fourth of the distance from the tip of  $R_4$  to the tip of  $M$ , the terminal portion about as long as the oblique cross-vein.  $R_2$  distinctly ending in the costa not far from the tip of  $R_1$ . Base of fork of  $Cu$  far beyond the cross-vein (three or four times the length of the latter); lower branch rather strongly arcuated. Halteres black; base of stem lighter. Wing-length, 2-2.2 mm.; body-length, ♂ 2.2 mm., ♀ about 1.8 mm.

Kieffer has described three species of this genus with

scales on the mesonotum, and I am acquainted with a British species which possesses similar scales. From this last, and probably also from the species described by Kieffer, *C. eltoni* differs conspicuously in the structure of the male hypopygium. In many respects *C. eltoni* resembles Kieffer's *Dactylocladius petreus*, var. *ursinus*, but among other distinctions the fork of *Cu* is shorter.

*Camptocladius oxonianus*, sp. n.

BEAR ISLAND: Walrus Bay, S.E. of island, 22. vi. 1921; c. 20 ft., on stones; 6 ♀.

♀. Entirely black; thorax slightly shining; eyes small, entire, bare. Palpi short. Antennæ 6-segmented; segment 2 rather stout, nearly twice as long as broad, slightly constricted in the middle; 3-5 constricted at each end, with long verticil-hairs; 6 slender, fully twice as long as 5, without verticil-hairs, but with about six sets of short pale sense-bristles. Mesonotum without scales. Legs without long hairs. Fourth tarsal segment on all the legs about two-thirds as long as the fifth. Empodium almost as long as the claws. No pulvilli. Wings dingy whitish, the anterior veins scarcely darkened. Membrane quite bare, with a vacuolated appearance under a magnification of 80. Costa not extending beyond the tip of  $R_4$ . Distance from tip of  $R_4$  to tip of  $M$  about equal to that from tip of  $M$  to tip of  $Cu_1$ .  $R_1$  short, only about 0.4 as long as  $R_4$ .  $R_2$  ending in costa close to the tip of  $R_1$ . Base of fork of  $Cu$  distant from the base of  $M$  by about twice the length of the cross-vein.  $Cu_2$  rather strongly curved downwards beyond the middle, widely divergent from  $Cu_1$ . Halteres black. Wing-length 1.8 mm; body-length about 1.5 mm.

In spite of the regrettable absence of the male, it seems worth while to describe this species, since it is the only one yet found in the islands in which the costa ends at the tip of  $R_4$ . I have been unable to trace a description of a European species which fits it exactly. Kieffer's *C. tibialis* seems to be similar in many respects, but has the fourth tarsal segment longer than the fifth.

*Key to the Species of Camptocladius (sens. lat.), now known from Spitsbergen and Bear Island.*

- |  |    |
|--|----|
| 1. Wings white or whitish, the membrane quite bare .....               | 2. |
| Wings pale greyish, the membrane with minute setæ 2-4 $\mu$ long ..... | 8. |

2. Small pulvilli present ..... *stercorarius*, Deg.  
Pulvilli absent ..... 3.
3. Costa ending abruptly at tip of  $R_4$ ; eyes bare .  
Costa produced well beyond tip of  $R_4$ ; eyes  
pubescent ..... 4.
4. Base of cubital fork very little distant from  
the base of  $M$  (scarcely the length of the  
cross-vein) ..... *curvinervis*, var. *polaris*, Kieff.  
Base of cubital fork much beyond the base of  
 $M$  (twice the length of the cross-vein or  
more) ..... 5.
5.  $R_4$  approximated to the costa apically; costa  
reaching far beyond the tip of  $R_4$  ..... 6.  
 $R_4$  not approximated to the costa apically;  
costa extending only a short distance beyond  
the tip of  $R_4$  ..... 7.
6. Length 3 mm.; second antennal segment  
cylindrical, scarcely constricted; last palpal  
segment at least half as long again as the  
penultimate; fourth tarsal segment shorter  
than the fifth, and only twice as long as broad ..... *spitzbergensis*, Kieff.  
Length 2 mm.; second antennal segment con-  
stricted near the base; last palpal segment  
hardly longer than the penultimate; fourth  
tarsal segment hardly shorter than the fifth,  
and nearly three times as long as broad .... *longicosta*, sp. n.
7. Length 3 mm.; male claspers with two spines. *flavinervis*, Kieff.  
Length 1.5 mm.; male clasper with only one  
spine ..... *extremus*, Holmgr.
8. Mesonotum with hairs only ..... *pumilio*, Holmgr.  
Mesonotum with short lanceolate scales mixed  
with the hairs. .... *eltoni*, sp. n.

*Psectrocladius borealis*, Kieff.

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 10. vii., 19. viii., and 14. viii. 1921 (*C. S. Elton* and *R. F. Stobart*); 0-50 ft., on shingly raised beach and on hut-window; 100 ♂, 28 ♀. Cape Boheman, N. side of Ice Fjord, 12. vii. 1921; rocky tundra near coast; 7 ♂, 1 ♀.

I think there can be very little doubt of the identification, though the male antennæ differ slightly. Kieffer states that segments 12 and 13 are as long as broad, and segment 14 twice as long as 2-13 together, whereas in our specimens (observed in the dry state) segments 12 and 13 are broader than long, and segment 14 is nearly three times as long as 2-13 together. The species is extremely similar to *P. carbonarius* (Mg.), Goetghebuer, but differs in the longer terminal spine to the male claspers and in some other small points.

*Psectrocladius limbatellus* (Holmgren).

Synonyms: *Chironomus limbatellus*, Holmgren; ? *Psectrocladius stratiotis*, Kieffer.

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 19. vii. and 14. viii. 1921; 0-50 ft., on shingle of raised beach, and on hut-window; 206 ♂, 43 ♀.

This is considerably smaller than *P. borealis*; the male with lighter thoracic ground-colour, differently constructed antennæ, and no beard on the front tarsi. The pulvilli are well marked, being more than half as long as the claws. The agreement with Holmgren's *C. limbatellus* seems sufficiently close, but it should be noted that the head of the male is darker than that of the female, often almost black, and that the cubital fork is longer in the female than in the male. Structurally the species seems almost identical with *P. stratiotis*, Kieff., as redescribed by Goetghebuer, but according to this author the terminal segment of the male antennæ is one-third longer than segments 2-13 together, whereas in the Spitsbergen specimens it is more than half as long again. I have, however, seen British specimens, probably referable to *P. stratiotis*, which I can hardly distinguish from those from Spitsbergen.

*Orthocladius consobrinus* (Holmgren).

SPITSBERGEN: Cape Boheman, N. side of Ice Fjord, 16. vii. 1921; flying over wet tundra near ponds; 6 ♂, 1 ♀. Bruce City, head of Klaas Billen Bay, 19. vii. 1921; round huts, on shingle of raised beach; 2 ♂.

PRINCE CHARLES' FORELAND: N.E. of island, 3. vii. 1921; c. 40 ft., on tundra of raised beach; 7 ♂.

This species is remarkable for the well-developed tarsal beard of the male. In this character, as well as in size and colour, it bears a superficial resemblance to *Psectrocladius borealis*, but, apart from the generic character of the absence of pulvilli, it differs from *P. borealis* in the milk-white wings and in the clearer yellow colour of the halteres. Holmgren mentions these two last points, thus establishing the fact that this, and not *P. borealis*, was the species which he had before him. Kieffer refers *C. consobrinus* to *Camptocladius*, but this is surely an error; the size is considerably larger than any known *Camptocladius*, and *Cu*<sub>2</sub> is only very slightly curved, as usual in *Orthocladius*. The terminal segment of the flagellum of the male antennæ is fully twice as long as the remaining segments together, these being much broader

than long. The male hypopygium is as in fig. 5 (p. 197). The empodia are scarcely distinguishable in the ♂, about one-third as long as the claws in the ♀. The costa extends slightly beyond the tip of  $R_1$ , which is straight.

I am acquainted with a British species (as yet undetermined) which is extremely close to *O. consobrinus*, but differs in the form of the male clasper.

*Orthocladius decoratus* (Holmgren).

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 14. viii. 1921; on hut-window; 1 ♀.

The single specimen appears to answer in almost every respect to Holmgren's description. It differs from *O. consobrinus* ♀ in the greyish, finely punctuate wings and in the longer cubital fork, the base of which is just perceptibly before the base of *M*. The head is blackish in colour, unlike that of *Psectrocladius limbatellus* ♀, which is dingy yellowish. The empodia are small, about as in *O. consobrinus* ♀. The costa extends very slightly beyond the tip of  $R_4$ . The specimen seems too large to be the female of *O. festivus*.

*Orthocladius festivus* (Holmgren).

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 14. viii. 1921; on hut-window; 3 ♂.

On account of the black colour of the whole thorax, including (as far as can be seen) the pleuræ, and the yellow halteres, I think this identification must be correct, though it is rather difficult to decide between this and *O. decoratus*. The wings are whitish, not perceptibly punctate under a magnification of 80; the costa does not extend beyond the tip of  $R_4$ . Hypopygium as in fig. 6 (p. 197).

*Orthocladius ? conformis* (Holmgren).

BEAR ISLAND: Walrus Bay, S.E. of island, 22. vi. 1921; 20-50 ft., quarter mile inland, under stones on shady slope; 1 ♂.

I make this identification with some hesitation, since the species was described from Spitsbergen, but the specimen appears to agree in every respect with Holmgren's description. The terminal antennal segment is very little longer than the remaining flagellar segments together, the penultimate segment being almost twice as long as broad. The hypopygium (fig. 7) agrees in most respects with Kieffer's description of that of *O. arcticus*, the side-pieces



having a median lobe which is much broader than long, and the claspers being unusually broad. The empodia are less than half as long as the claws, which are more slender and sharply pointed than in many male *Orthocladius* (agreeing in this respect with *O. festivus*), and have each a long curved hair arising from the base. The wing-membrane has no distinct punctuation, the anterior veins are scarcely darkened (a point not mentioned by Holmgren), and the costa extends slightly but distinctly beyond the tip of  $R_4$ .

*Key to the Species of Orthocladius and Dactylociadus  
now known from Spitzbergen and Bear Island.*

- |   |     |   |
|---|-----|---|
| 1. Thorax entirely black (♂ ♀) .....  | 2.  |   |
| Mesonotum with yellowish ground-colour (♀) or at least yellowish on the shoulders and part of pleuræ (♂). | 6.  |   |
| 2. Length 5 mm.; colour of halteres not stated; wings of ♀ with a few long hairs at the extreme tip ..... |     | <i>subpilosus</i> , Kieff.                    |
| Length 2-3 mm. ....   | 3.  |   |
| 3. Halteres black or brown .....  | 4.  |   |
| Knob of halteres pale .....   |     | <i>festivus</i> , Holmgr.                     |
| 4. First segment of front tarsi only about half as long as the tibia. ....                                |     | <i>petreus</i> , var. <i>ursinus</i> , Kieff. |
| First segment of front tarsi two-thirds as long as the tibia. ....  | 5.  |   |
| 5. Wings pale greyish, moderately broad (♀) .....   |     | <i>conformis</i> , Holmgr.                    |
| Wings dark greyish, very broad (♀) ..   |     | <i>obscuripennis</i> , Holmgr.                |
| 6. Wings milk-white .....   | 7.  |   |
| Wings transparent or greyish .....  | 8.  |   |
| 7. Front tarsi of ♂ bearded; ♂ thorax nearly all black .....  |     | <i>consobrinus</i> , Holmgr.                  |
| Front tarsi of ♂ not bearded; mesonotal bands distinct (♂ ♀) .....  |     | <i>arcticus</i> , Kieff.                      |
| 8. Body mostly brownish yellow; ♀ antennæ 7-segmented .....   |     | <i>heptameris</i> , Kieff.                    |
| Body largely blackish; mesonotum in ♀ with black stripes .....  | 9.  |   |
| 9. Legs yellowish; length 2 mm. ....  |     | <i>mixtus</i> , Holmgr.                       |
| Legs dark brown; length 2.5-3.5 mm. ....  | 10. |   |
| 10. Empodia hardly one-third as long as the claws .....   |     | <i>decoratus</i> , Holmgr.                    |
| Empodia nearly as long as the claws ..  |     | <i>spitzbergensis</i> , Kieff.                |

*CRICOTOPUS*, v. d. Wulp.

As now used by Kieffer, this genus includes those *Orthocladiaræ* which have hairy eyes and distinct pulvilli, *Trichocladius* including those with hairy eyes and no pulvilli; species with and without white-ringed tibiæ being

included in both genera. Kieffer has himself shown, however, that the pulvilli vary in size in the different species, and has recently erected the genus *Acricotopus* to include the intermediate species with very small pulvilli. I consider that van der Wulp's original conception of the genus was both simpler and more natural, and propose to include in *Cricotopus* all hairy-eyed Orthocladiaræ which have more or less distinctly white-winged tibiæ and whitish genital organs (at least in the female). In taking this course I am following Goetghebuer, but I would also go further and transfer the few dark-legged species which possess pulvilli (these also have dark genital organs) to *Trichocladus*.

*Cricotopus glacialis*, sp. n.

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 22. vii.—14. viii. 1921; on hut-window, on shingly raised beach (some taken ovipositing on pond), and on flowers of *Dryas octopetala* and *Saxifraga hirculus*; 40 ♂, 52 ♀.

N. EDINBURGH ISLAND (S.W. of Prince Charles' Foreland): on stones of rocky beach just above high tide, 29. vi. 1921; 3 ♂, 6 ♀.

*Head* dark brown, more yellowish below the antennæ. Antennæ and mouth-parts entirely blackish (♂ ♀). Palpi normal. Terminal flagellar segment of ♂ not quite twice as long as the remaining flagellar segments together, penultimate segment about as long as broad. Second antennal segment of ♀ distinctly constricted in the middle, segments 3–5 oval, segment 6 pointed, twice as long as segment 5, with rather numerous short sense-bristles, but no verticil. *Thorax* of ♂ blackish, except for the shoulders and the pleural sutures; of ♀ yellow, three well-separated mesonotal bands, postnotum, mesosternum, and part of pleuræ blackish, scutellum somewhat darkened. *Abdomen* of ♂ entirely blackish brown, including the first segment; tergites with narrow shining apical bands, remainder of surface almost dull. Hypopygium dark brown on the basal half, whitish on the apical half; structure as figured (fig. 8). *Abdomen* of ♀ dark brown dorsally, yellowish ventrally, especially towards base; lamellæ whitish yellow. *Legs* blackish brown, femora yellowish at the extreme base only; tibiæ with ill-defined whitish rings, more distinct on the posterior legs than on the front pair, and generally much more distinct in the ♀ than in the ♂, in the ♂ the front tibiæ often entirely dark; on the middle tibiæ the pale ring occupies about half and on the hind tibiæ about two-thirds

of the segment. Front tibiæ practically twice as long as the first tarsal segment. Front tarsi of ♂ not bearded. Fourth and fifth tarsal segments about equal in length. Pulvilli distinct but short, about one-third as long as the claws. *Wings* somewhat milky-white, not perceptibly punctuate under a magnification of 80. Costa not exceeding the tip of  $R_4$  in ♂, scarcely so in ♀. Cross-vein rather short, thick, somewhat darkened, and nearly vertical. Base of cubital fork distant from base of media by rather more than the length of the cross-vein. Halteres with dark stem and yellow knob. Wing-length 2-2.8 mm.; body-length, ♂ 2.7-3.5 mm., ♀ 1.8-3 mm.

This may possibly be Zetterstedt's *C. ephippium*, which was described from Lapland; the description, however, disagrees in some points, such as the breadth of the pale tibial rings and the separate thoracic stripes of the ♀. An extremely similar species, which was determined by Verrall as *C. ephippium*, is very common in Britain; it differs from the Spitsbergen form in the absence of pulvilli and slightly in the structure of the hypopygium.

Mr. Elton notes that eggs laid by this fly on 1.viii.1921 were frozen solid, and still developed into larvæ on unfreezing.

### *Cricotopus basalis* (Staeg.).

Synonyms: *Chironomus basalis*, Stågor; *C. parvidus*, Holmgren; ? *Trichocladius ursus*, Kieffer.

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 22.vii.-14.viii.1921; on shingly raised beach, on hut-window, and ovipositing in pond 1; 2 ♂, 4 ♀. Cape Bohe-man, N. side of Ice Fjord; 0-60 ft., flying over strip of marsh land; 1 ♀.

Differs from *C. glacialis* in the entirely black thorax of both sexes, the less distinctly ringed tibiæ of the ♀, the complete absence of pulvilli, and the structure of the hypopygium (see fig. 9). The white lamellæ of the female ovipositor, the whitish male claspers (though the side-pieces are dark), and the traces of white wings on the tibiæ, in my opinion, locate the species in *Cricotopus* rather than in *Trichocladius*. Originally described from Greenland, it has since been found in Jan Mayen (*Bristowe*).

### *Metriocnemus ursinus* (Holmgren).

BEAR ISLAND: Walrus Bay, S.E. of island, 22.vi.1921; c. 20 ft., on stones, and under stones in limestone gully,

quarter mile inland; 5 ♂, 2 ♀. S.W. of island, 22. vi. 1921; under walrus bones, on moss; 1 ♂. Tundra, W. of Mount Misery, 16. vi. 1921; 3 ♂.

SPITSBERGEN: Bruce City, Klaas Billen Bay, 19-22. vii. 1921; round huts, on shingle of raised beach; 2 ♂, 2 ♀. Cape Boheman, N. side of Ice Fjord, 12. vii. 1921; flying over strip of marsh land; 2 ♂, 7 ♀.

N. EDINBURGH I. (S.W. of Prince Charles' Foreland): on stones of rocky beach just above high tide, 29. vi. 1921; 8 ♂, 10 ♀.

I think this identification is quite certain. There is a rather remarkable sexual difference in the wings; in the ♂ the hairs are confined to the apical fourth, whereas in the ♀ nearly the whole surface is rather scantily hairy. The structural characters are otherwise almost identical with those of *M. cataractarum*, Kieff.

*Metriocnemus brevinervis* (Holmgren).

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 22. vii. 1921; on shingly raised beach with *Dryas*; 2 ♂.

On venational and other characters this belongs to the same group as *M. angulatus*, Goet., and *M. impensus*, Walk., but it is much darker than these species. Hypopygium, fig. 10.

DIAMESA, Mg.

The genus *Adiamesa*, Kieff., is founded solely on the characters of the male antennæ, and is indistinguishable from *Diamesa* in the female sex; I therefore prefer to include it under *Diamesa*. *Psilodiamesa*, Kieff. (which is unknown to me), seems to be distinct by venation. Some of the species dealt with below have bare eyes, and would perhaps be included by Kieffer in *Psilodiamesa*, but as the venation of these is normal, and as the length and density of the eye-hairs varies with the species, I prefer not to separate them from *Diamesa*. None of the Spitsbergen species are identical with any of the ten British forms of this group known to me.

*Diamesa ursus* (Kieffer).

BEAR ISLAND: Walrus Bay, 15-22. iv. 1921; on bare rock, under plank, and under stones quarter mile inland; 3 ♀. Inland from S. coast, 14. vi. 1921; on hillock green with vegetation; 3 ♀.

This species was described from the ♂ only, and the

association of these specimens is largely conjectural, but there seems to be no other described species with which they can be identified. The antennæ are 8-segmented, but the segments are not very well separated, the 7th in particular being small and not clearly marked off from the 8th, though distinguishable by its hair-whorl. The second segment is rather large, stouter than the following, and rather sharply constricted on the dorsal surface near the base. Segment 8 is nearly as long as 4-7 together. The lamellæ of the ovipositor (fig. 11) are very large, irregularly shaped, and yellowish. The wings have a rather pronounced brownish-grey tint, and as is the case in the females of many species of this genus (including all those known from Spitsbergen) the apical part of  $R_1$  is considerably swollen and very closely approximated to the costa, and the basal fourth of  $R_2$  is darkened.

It is probable that the ♀ ♀ from Bear Island referred to *D. arctica* by Kieffer in 1911 really belong here, since he refers to the unusually large lamellæ of the ovipositor.

*Diamesa hyperborea*, Holmgren.

BEAR ISLAND: Walrus Bay, S.E. of island, 22.vi.1921; 20-50 ft., quarter mile inland under stones on shady slope; 1 ♀.

This specimen is much smaller than those of *D. ursus* (wing-length 3 mm., instead of 4-6 mm.) and has the lamellæ of the ovipositor proportionately much smaller and quite differently and more regularly shaped (fig. 12). In size and most other points it agrees with Holmgren's description. The antennæ are 8-segmented and not 6-segmented, but I do not consider that any importance need be attached to this apparent difference. No species of *Diamesa* are definitely known with the antennæ 10-segmented in the ♂ and 6-segmented in the ♀, and it is extremely unlikely that the only two species which Holmgren described should really possess these characters; it is much more probable that he made an excusable error in counting the segments, which are at best poorly defined.

*Diamesa arctica* (Bohem.).

There is no species in the Oxford collection which can be positively identified with *D. arctica*, but I think I can so regard a male in the British Museum from King's Bay,

Marble Island, Spitsbergen, 26. viii. 1911 (*M. A. Fenton*). The eyes are shortly but conspicuously hairy; the antennæ are plumose, 13- or 14-segmented, the terminal segment about one-third longer than the remaining flagellar segments together. The hypopygium (fig. 13) is similar in structure to that of the American species figured by Malloch as *D. waltli*, Mg., but the side-pieces and the spine of the ninth tergite are much more elongate. The species identified as *D. arctica* by Kieffer in 1911 (renamed by him in 1919 *D. lundstroemi*) has quite a different hypopygium.

*Diamesa poultoni*, sp. n.

SPITSBERGEN: Green Harbour, S. side of entrance to Ice Fjord, 28. vi. 1921; 0-100 ft., flying; 4♂, 2♀.

PRINCE CHARLES' FORELAND: Pt. Carmichael, Freshwater Bay district, N.E. of island, 1-10. vii. 1921; 30-100 ft., at flowers of *Saxifraga oppositifolia*, on tundra of shingly raised beach, flying and resting on snow and under stone on hill; 5♂, 9♀.

*Head* blackish, rather conspicuously dusted with grey, especially in the ♀; frons without a definite central channel. Eyes bare in both sexes; widely separated, entire. Mouth-parts and antennæ entirely blackish. Antennæ of ♂ plumose, 14-segmented, basal flagellar segments transverse, penultimate segments about as broad as long, terminal segment about one-third to one-half longer than the remaining flagellar segments together. Antennæ of ♀ 8-segmented, segment 2 rather stout, nearly half as long again as broad, scarcely constricted; segments 3-7 short, rather ill-defined, and gradually diminishing in size, segment 8 as long as segments 5-7 together. *Thorax* blackish, in ♀ with fairly distinct grey dusting which leaves the usual three mesonotal stripes black. Scutellum with long and moderately dense black hair. *Abdomen* blackish brown, with brownish hair. Hypopygium (fig. 14): ninth tergite with a long sharp terminal spine; side-pieces with flat, bare, and pointed basal lobes and small, slightly hairy, and subapical lobes; claspers stout on the basal third, then rather abruptly narrowed, tapering to a rounded point, no terminal spine. Lamellæ of ovipositor (fig. 15) small, black. *Legs* blackish, short-haired, hairs on front tarsi of ♂ very slightly longer. First segment of front tarsi about two-thirds to four-fifths as long as the tibia, fourth segment of all tarsi about two-thirds to

three-quarters as long as the fifth, not very broad, emarginate apically. Empodia about two-thirds as long as the claws. *Wings* slightly greyish-tinged. Lobe right-angled or slightly produced. Costa extending slightly beyond the tip of  $R_4$ . Costal cell much broader in ♀ than in ♂ (as usual) and tip of  $R_1$  swollen in ♀. Cross-vein  $r-m$  long, strong, curved, 2.5–3 times as long as  $m-cu$ ; distance between  $r-m$  and  $m-cu$  variable, but short. Halteres yellowish. Wing-length 4–5 mm.; body-length, ♂ 4–4.5 mm., ♀ 2.7–3.7 mm.

It is quite likely that this may have formed part of Holmgren's series of *D. arctica*, especially since some of his material came from Green Harbour, but as he states that the lamellæ of the ovipositor are testaceous, not black, I have not adopted his name for the species. There is in the British Museum a female apparently belonging to this species from Novaya Zemlya (Matotchski Sound, 23 June, 1880, Captain A. H. Markham, R.N.).

*Diamesa poultoni*, var. *flavipila*, n.

PRINCE CHARLES' FORELAND: Pt. Carmichael, Freshwater Bay district, N.E. of island; 1 ♀.

Differs from typical *D. poultoni* as follows:—Wings almost milky; hair on scutellum yellow, instead of black.

*Diamesa septima*, sp. n.

BEAR ISLAND: south of island, 17.vi.1921; flying over barren *Tetradium* limestone; 1 ♀.

Differs from *D. poultoni* as follows:—Second antennal segment smaller, scarcely longer than broad. Lamellæ of ovipositor yellow and rather more rounded (fig. 16). Fourth tarsal segments rather shorter, about 0.6 as long as the fifth. Cross-vein  $r-m$  shorter, scarcely twice as long as  $m-cu$ . Wing-length 4 mm.; body-length 3.2 mm.

*Key to the Species of the Diamesa Group now known  
from Spitsbergen and Bear Island.*

1. Cross-vein  $r-m$  short and transverse,  
 $m-cu$  long and oblique; legs largely  
 whitish ..... *Psilodiamesa spitzbergensis*, Kieff.
2. Cross-vein  $r-m$  long and oblique,  
 $m-cu$  short and transverse; legs  
 blackish ..... 2.

- |   |                               |
|---|-------------------------------|
| 2. Eyes bare.....   | 3.                            |
| Eyes hairy.....   | 5.                            |
| 3. Lamellæ of ovipositor black.....   | <i>poultoni</i> , sp. n.      |
| Lamellæ of ovipositor yellow.....   | <i>septima</i> , sp. n.       |
| 4. Male antennæ plumose, the terminal segment longer than the remaining segments together.....                      | 5.                            |
| Male antennæ not conspicuously plumose, the terminal segment much shorter than the remaining segments together..... | 6.                            |
| 5. Side-pieces of male hypopygium each with two terminal appendages ..  | <i>lundstroemi</i> , Kieff.   |
| Side-pieces each with only a single appendage.....  | <i>arctica</i> (Bohem.), Edw. |
| 6. Size 4-5 mm.; lamellæ of ovipositor very large.....  | <i>ursus</i> , Kieff.         |
| Size 2-3 mm.; lamellæ of ovipositor small.....  | <i>hyperborea</i> , Holmgr.   |

## Culicidæ.

*Aedes alpinus* (L.).

Synonyms: *Culex alpinus*, Linn.; *C. nigripes*, Zett.

SPITSBERGEN: Bruce City, head of Klaas Billen Bay, 22. vii. and 2. viii. 1921; flying over shingle with tundra and ponds; 3 ♀.

## Anisopodidæ.

*Trichocera lutea*, Becher. (Fig. 17.)

BEAR ISLAND: Walrus Bay, S.E. of island; 14. vi. 1921; 1 ♂, 1 ♀, flying; 15. vi. 1921, under plank on bare rock, c. 10 ft., 7 ♂, 5 ♀.

All the specimens are blackish, without any definite trace of the yellow thoracic markings described by Becher, but the remarkable male hypopygium places the identification beyond question. The only other known species with a hypopygium at all approaching this in structure is the North European *T. forcipula*, Nielsen. *T. lutea* is also peculiar in its venation, most specimens having *r-m* placed slightly before the apex of *Rs*, a unique character in this family; in a few wings of *T. lutea* the position of *r-m* varies from the normal, being either at or slightly beyond the fork of *Rs*.

Quite possibly the *Trichocera* recorded from Spitsbergen by Boheman and Holmgren as *T. parva* and *T. hiemalis* may be this species, but there is no reason why *T. hiemalis* should not occur.



XXII.—*Note on Root-division in the Molar Teeth of Tritylodon.* By Dr. BRANISLAV PETRONIEVICS.

THE longitudinal root-division in the molar teeth of *Tritylodon* was definitively established by the present writer in a previous paper (comp. "On the Skull of *Tritylodon longævus*," in *Ann. & Mag. Nat. Hist.* [8] vol. xx., 1917, p. 283). The transverse root-division in the molar teeth of the similar type *Stereognathus*, also established by me in another paper ("Note on the Lower Jaw of *Stereognathus ooliticus*," in *Ann. & Mag. Nat. Hist.* [9] vol. i., 1918, p. 67), suggested the possibility of the same division in *Tritylodon*. This suggestion was confirmed by a new preparation of the specimen (M. 1951) in the British Museum during my last stay in London in 1920.

The text-figure shows the hinder side of the recently



Section of the penultimate molar of *Tritylodon longævus*, Owen, left side.  
Nat. size.

prepared penultimate molar of *Tritylodon* situated on the left side of the skull (comp. *l. c.* tooth 5 in text-fig. 2), the same which shows the longitudinal root-division also (comp. the photograph, *l. c.* pl. x. fig. 2). But while in its longitudinal direction it has only two roots, its transverse direction is characterized by three distinct roots (*a*, *b*, *y* in the figure), corresponding to the three longitudinal rows of cusps. The middle root (*b* in the figure)—the shortest of the three—is the largest, is of triangular shape, and shows the closed pulp-cavity in section. The inner root (*a* in the figure), closely applied to the middle one, is of rectangular shape, while the outer (*y* in the figure) is the longest, but in the present state of the specimen unfortunately represented by a small fragment only (in the photograph, *l. c.* pl. x. fig. 2, it was still complete). Behind the penultimate molar in question there was in the specimen a root-impression of the last molar (which has been cut away by the new preparation), showing only an imperfect transverse division of this root.

It is, I think, not necessary to emphasize the importance

of the fact now established for the mammalian character of *Trityledon*, the transverse root-division of its molars excluding completely any possibility of it being a reptile.

Finally, I desire to express my thanks to Dr. Woodward, of the British Museum, for permission to describe the new preparation (executed by F. O. Barlow); also to Dr. Andrews, of the British Museum, for some valuable help.

XXIII.—*Two new Fishes from New Britain and Japan.*

By J. R. NORMAN.

(Published by permission of the Trustees of the British Museum.)

*Trachypterus pentastigma*, sp. n.

Body decreasing in depth from head to tail, greatest depth (at occiput)  $5\frac{1}{2}$  in length. Smooth; belly with a narrow prickly area extending from behind insertion of pelvics nearly to root of caudal. Lateral line complete, armed with small spines in the caudal region. Head higher than long, its length  $6\frac{1}{2}$  in length of body; anterior profile nearly vertical. Snout shorter than eye, which is placed above middle of head, and is  $\frac{1}{2}$  of its length; interorbital width  $\frac{2}{3}$  diameter of eye. Mouth small, nearly vertical; maxillary broad and rounded behind, reaching vertical from anterior third of eye; jaws equal; angle of lower jaw below pupil; both jaws without teeth. Dorsal VI 164; commencing above anterior third of eye and extending almost to base of caudal. Pelvics 6-rayed, inserted just behind base of pectorals. Caudal with 8 elongate rays inserted at right angles to axis of body, longest more than  $\frac{1}{2}$  length of body; six short rays below these. Coloration pinkish; five large, round, brown spots on sides of body, two above lateral line, two above anterior part of belly, and one below anterior part of second dorsal; a narrow dark streak along base of entire dorsal fin; all fins pale.

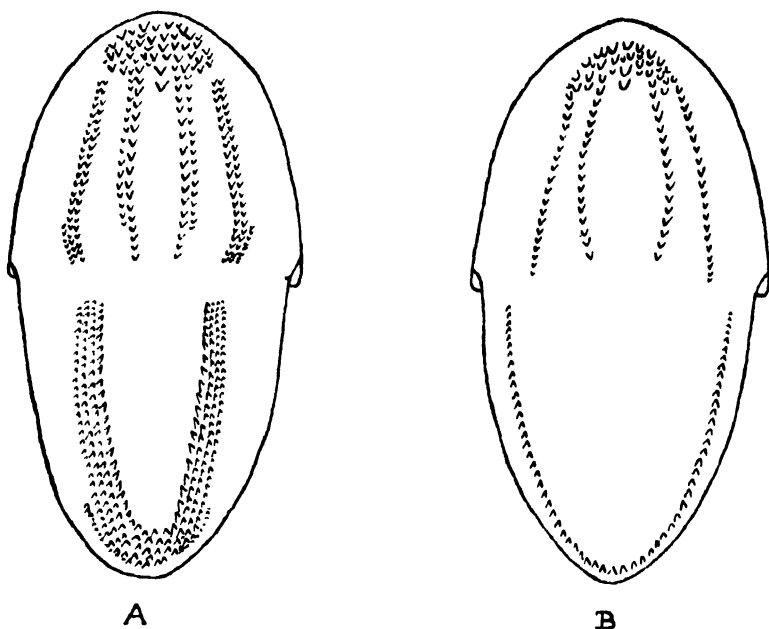
A single specimen, 135 mm. in total length, from Misaki, Japan, collected and presented to the British Museum by Mr. A. V. Insole.

BRACHYCONGER, gen. nov.

Closely related to *Xenoconger*, Regan\*, from which it

\* Trans. Linn. Soc. ser. 2, Zool. xv. pt. 2, 1912, p. 301; Ann. & Mag. Nat. Hist. ser. 8, x. 1912, p. 881.

differs in the following characters:—Tail short; posterior nostril labial; teeth uniserial.



Dentition of A. *Xenoconger fryeri*, B. *Brachyconger platyrhynchus*.

*Brachyconger platyrhynchus*, sp. n.

Tail slightly longer than rest of fish. Head a little broader than deep, its length about  $\frac{3}{4}$  of the length from gill-opening to vent; snout broad and flat, rounded anteriorly, its length nearly  $\frac{1}{2}$  length of head and slightly more than diameter of eye. Jaws equal anteriorly; cleft of mouth horizontal, extending to below posterior border of eye. Anterior nostril almost at end of snout; posterior just in front of vertical from anterior margin of eye. Dorsal and anal fins well developed; former commencing at a distance from the gill-opening equal to  $\frac{2}{3}$  length of head. Brownish, paler below; caudal with a very narrow pale margin.

A single specimen, 130 mm. in total length, from New Britain.

XXIV.—*Results of the Oxford University Expedition to Spitsbergen, 1921.*—No. 15. *Saw-flies.* By F. D. MORICE.

TWELVE specimens in all of this group were captured during the Expedition, but two only actually in Spitsbergen, the remainder on Bear Island, which lies between Spitsbergen and the North Cape. All are labelled as taken by C. S. Elton between June 14 and 26. Mr. Elton describes the surface of Bear Island visited by him as "shattered rock with very sparse tundra."

Like most of the saw-flies yet recorded from high northern attitudes, all belong to the tribe Nematini, and would have been included till recently in the Jurinean genus *Nematus*; but, according to our present classifications, three genera are represented among them, and each of these genera by a single species. Of the twelve specimens all but one are males, and none of the records throw any light on their attachment to any particular food-plant; but they are all such as might be expected to oviposit on some species of *Salix*, and one (the *Pontania*) is no doubt a gall-maker.

None of the species, I believe, are "new to science," nor do any of them appear to be actually confined to Spitsbergen or Bear Island. No. 1 was first described from "Lappland and Jemtland" (in Sweden). No. 2, known hitherto only from Spitsbergen, occurred on this occasion both there and in Bear Island. No. 3 seems to be a form described from the New Siberian Islands and the mouth of the Lena. All belong to genera which are well represented in Northern Europe and Siberia, and it seems most probable that they have spread into their present habitats from the nearest parts of the adjacent continent comparatively lately—i. e., certainly since the Glacial Period,—though it is not easy to suggest any probable manner in which they can have crossed the intervening seas, for they have but little power of flight, and do not (like *Sirex* etc.) feed or pupate inside logs which might be floated to a distance from their birth-place.

Although I have not seen the actual "author's types" of any of these three species, I do not feel much hesitation about identifying them as follows. The largest of them (the *Amauronematus*) has, I believe, been described several times under different names, and I give these names as synonyms with the year in which each was first published. I reproduce also, from the label attached to each specimen, Mr. Elton's

notes as to the exact locality and other circumstances of its capture.

*List of the Specimens.*

1. *Amauronematus villosus*, Thoms., 1862 (described, as *Nematus villosus*, from "Lapland and Jemtland").

= *Nematus arcticus*, Holmgren, 1869 (described from "Spitzbergen").

= *Nematus brachyacanthus*, var. *palliditarsis*, Cameron, 1876 (described from a specimen now in Brit. Mus. taken by Eaton in Spitsbergen).

= *Nematus gelidus*, W. F. Kirby, 1882 (described from the same specimen in Brit. Mus. In the appendix to his Catalogue Kirby adopted Cameron's name *palliditarsis*).

= *Amauronematus hyperboreus*, Schmiedeknecht (nec Thomson !), 1911.

1 ♂, June 14. S.E. of Bear Island, Walrus Bay. "Flying over Tetradium limestone."

1 ♂, June 15. S.E. of Bear Island, Walrus Bay. "On bare rock: about 20 feet."

1 ♂, June 16. E. of Bear Island. "Tundra W. of Mount Misery: 0-150 feet."

1 ♀, June 17. S. of Bear Island. "Flying over barren Tetradium limestone."

2. *Pristiphora frigida*, Bohem., 1865 (described as *N. frigidus* from Spitsbergen. *Pristiphora adelungi*, Konow, 1902, seems to be only a dark-legged form of the same species, and identical with a var. mentioned by Bohemann. Konow and Enslein identify Bohemann's *frigidus* with the common European form *P. melanocarpa*, Hartig; but this seems hardly probable).

1 ♂, June 14. S.E. of Bear Island, Walrus Bay.

2 ♂♂, June 26. W. Spitsbergen, head of Ice Fiord, Gyps Valley. "100-200 ft.: slope with *Dryas* and *Saxifraga*."

3. *Pontania birulae*, Konow, 1907 (described and figured from "the New Siberian Islands and the mouth of the Lena").

2 ♂♂, June 16. E. of Bear Island. "Tundra W. of Mount Misery: "0-150 feet."

3 ♂♂, June 22. S.E. of Bear Island, Walrus Bay. "30-40 ft.: hillside, quarter mile inland, under stone or plant."

XXV.—Notes on *Lucernaria quadricornis*, Müller, and related Species. By RICHARD ELMHIRST, F.L.S., Superintendent of the Millport Marine Biological Station.

*Lucernaria quadricornis*, O. F. Müller, Haeckel, System der Medusen, p. 390 (1880).

*Lucernaria quadricornis*, Müller, Beaumont, VI. Ann. Rep. L. M. B. C. p. 31 (1892).

*Halicystus* sp. (? n. sp.), Beaumont, L. M. B. C. Reports upon the Fauna of Liverpool Bay, p. 159 (1895), reprinted from Trans. Liverp. Biol. Soc. vol. vii. pp. 253-263 (1894).

The original Clyde record for this species is given by Dr. Johnston (1847) as found by Mr. Joshua Alder "adhering to stones at low-water mark at Ardrossan, in May, 1846." This record has since been repeated in various lists etc. In the Annual Report of the Millport Station for 1904 Dr. Russell records *Lucernaria* sp. ?, from Bennan Head, S. Arran. In 1909, when collecting *Depastrum* near this station, I found several specimens of a *Lucernaria* which could not readily be assigned to any known species, owing to the presence of single capitate tentacles in some of the marginal bays. In 1919 Prof. Gemmill found a similar specimen, and I procured another in Vidlin Voe, Shetlands, in Feb. 1916.

In 1894 the late W. I. Beaumont, in a note on *Lucernarians* occurring in the neighbourhood of Port Erin, Isle of Man, describes three specimens from "undersides of stones on the S. side of Port Erin Bay, where *Depastrum* also occurs." These, in view of the paucity of material, he refers "provisionally to the genus *Halicystus*, as "*Halicystus* sp. (? n. sp.)." He based this identification on the presence, apparently only definitely observed in one specimen, of "primary tentacles (retaining the original tentacular structure instead of being modified into marginal anchors)," which occurred in the eight marginal bays, and on the rather complicated structure of the gonads, although he had already referred them to *Lucernaria quadricornis* Müller (L. M. B. C. Rep. 1892, p. 31), and despite the fact that they had single-chambered stalks—a character distinctive of the genus *Lucernaria*. No further specimens of this species have occurred at Port Erin.

The accompanying table (p. 222) shows the characters of the specimens available.

The erratic occurrence of these "primary tentacles" surely indicates that they are negligible as diagnostic characters, and of small significance when compared with an important

Date.	Locality.	Length in mm.	Tentacles per arm.	Primary tentacles.
1892.	Port Erin.	7 alive.	7	1 in each bay.
1904. vii. 11.	S. Arran.	8 preserved.	10	None seen; specimen much crumpled.
1909. v. 13.	Cumbræ.	8 "	8 <sup>30</sup>	2 in opposite periradii.
"	"	9 "	9	1 periradial external; 1 in next interradius internal; 3 of one arm placed internally away from the rest.
1919. vii. 11.	"	10 "	12	1 in each bay.
1909. v. 13.	"	10 "	10	2 interradial and 1 on radial slope of an arm.
"	"	10 "	14	1 radial and 1 in adjacent interradius.
"	"	10 "	19	2 in opposite radii and 1 interradial; specimen rather contracted.
"	"	11 "	15, 21	2 radial.
"	"	13 "	15	1 radial; 3 interradial; all external to the margin.
"	"	14 "	18	1 radial and 1 in adjacent interradius.
1916. ii. 10. }	Vidlin Voe, }	20 "	100	3 interradial.
"	Shetlands. }	40 alive.		

morphological character like the coelenteron of the stalk being single- (*Lucernaria*) or four-chambered (*Haliclystus*)—especially as variations, numeral and other, so frequently occur in Lucernarian tentacles (Clark, Beaumont, Hornell, Browne). Antipa (1892) has described a young *Craterolephus tethys* which had a single tentacle in each of four neighbouring octants. Browne (1895, p. 4) mentions two *Haliclystus octoradiatus* having "capitate tentacles on the margin of the umbrella in an abnormal position." Further, Hornell (1893, p. 208) has noted the presence of "marginal bodies" in the young of *L. campanulata*. Variations of this type must, I think, be regarded as "vestiges of the tentaculocyst-rudiments of ancestral scyphistomata" (Hurst, p. 214); it is noteworthy that these vestigial characters occur chiefly in young specimens, just as the presence of tentacles on the marginal anchors is a normal condition of young *Haliclystus* (Beaumont, 1900).

These Clyde specimens I regard as young *Lucernaria quadricornis*, Müller, and they agree with that species in the following characters:—Funnel-shaped, slightly four-sided; stalk single-chambered, from equal to twice the length of the body, cylindrical, annular in contraction; perradial bays twice as broad and deep as the interradial; gonads extending to the ends of the arms; arms ending in a cluster of capitate tentacles, eight to twenty-one in number.

The smaller Clyde specimens were yellow in colour, like the Port Erin ones; the larger were olivaceous brown, like the Shetland one.

These specimens also are, I think, referable to *L. quadricornis*, Müller. The structure of the gonads is very similar to that of *Haliclystus* (Clark, 1878, p. 67). They form eight adradial bands, composed of "hollow spheroidal saccules . . . attached to the inner faces of the circumoral parietes. They are totally disconnected from each other, but usually so crowded that their peripheries come in contact and mutually mould themselves into polygonal shapes." The saccules open, each by a short oviduct, into the radial pouches. The specimen which Beaumont sectioned was ripe, but rather crumpled, which makes the details difficult to follow; but, after a careful comparison, I think they agree with a Clyde specimen (1919. vii. 11) which is as described.

My thanks are due to the Director of the Plymouth Laboratory for his courtesy in lending Mr. Beaumont's sections to me.



*Lucernaria quadricornis.*

Breeds in the summer months:—Clyde, ova in May and July; Port Erin, between June and Sept. (*Beaumont*); Shetland, Feb., unripe.

*Lucernaria campanulata*, Lamouroux.

By the courtesy of Prof. Dakin I have been able to examine two specimens taken on the south end of the Isle of Man at Easter 1920. They agree closely with Haeckel's description, except that some of the arms have more than 40 tentacles (46-48).

This is the first Manx record of this species, although it is recorded from the east of Ireland.

Breeding:—Leith, ripe in April (*Dr. Johnston*); Scarborough, ripe in May, spent in Sept., young July and August (*Dr. Irving*); English Channel, summer (*Hornell and Hurst*).

*Haliclystus octoradiatus*, Clark (following Beaumont, 1900, and regarding *H. auricula* and *H. octoradiatus* as forming "a series belonging to one species").

Scarborough, ripe in July, young in July, August, and September (*Dr. Irving*); Valencia, ripe in May (*Beaumont*); English Channel, ripe in summer, half-grown in June (*Hornell and Hurst*); ripe, March and April, 1919, at Plymouth (M. B. A. record *in litt.*); Welsh coast, half-grown and ripe in August (*R. E.*). This indicates two generations in the year, the second mature at four or five months old.

*Depastrum cyathiforme*, Gosse.

Clyde, ripe, April to August; very young, July to Sept. Port Erin, summer (*Beaumont*).

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XXVI.—*Notes on certain Reproductive Phenomena in some Tasmanian Marsupials.* By Professor T. THOMSON FLYNN, D.Sc., University of Tasmania.

KNOWING well the great importance of securing, while there is still time, a representative collection of intra-uterine stages and pouch-young of the fast-disappearing marsupial fauna of Tasmania, and, having been assisted in the attainment of this end by the funds placed at the disposal of the University of Tasmania by the Trustees of the estate of the late John Ralston and by a grant from the British Association, I have in the last few years set myself to this task. The net result is that a most valuable series of such stages, ranging from early segmentation onward, has been obtained, and is now being investigated in the Biological Department of the University of Tasmania.

The greater proportion of this valuable material is of the common diprotodont marsupial *Pseudochirus cooki* (the Tasmanian "ringtail" phalanger) \*; but stages have also been obtained illustrating the development of *Trichosurus*, *Perameles*, *Potorous tridactylus*, *Bettongia cuniculus*, and some other forms.

Some of the larger problems presented by this material are now being investigated, but, during the course of collecting and examining, note has been made of a number of points connected with the natural history of these interesting mammals, and, in view of the general significance of these facts and our meagre knowledge of even the more ordinary details of marsupial life, opportunity is being taken in this short communication to put them on record. Further, the notes on breeding-seasons etc. may be useful to future collectors in this very distant but biologically interesting portion of the empire.

Almost all the collecting has been done during the winter months, since it is during that time of the year in Tasmania that the professional trapper shows his greatest activity.

In the vicinity of Hobart the marsupial most easily obtained is *Pseudochirus cooki*. Naturally enough, my notes refer to this marsupial more than to any other.

*Pseudochirus cooki* is a small diprotodont marsupial,

\* Matschie has lately revised the genus *Pseudochirus* (Sitzb. Ges. nat. Freunde, Berlin, 1915), and has altered the specific name of the Tasmanian form to "*pulcher*." However, until Matschie's conclusions have been agreed to by taxonomists more experienced than myself, I prefer to keep to the better-known specific designation *cooki*.

nocturnal in habits, found almost invariably (in southern Tasmania) in those eucalypts known familiarly as "peppermint gums," on the succulent terminal twigs of which it feeds. It is particularly hard to trap, and is obtained generally by "mooning"—that is, by shooting on moon-light nights in the way described by Broom for *Trichosurus vulpecula*\*. In this way it is quite possible for a good shot, with a well-trained dog, under favourable conditions to get a bag of some four or five dozen animals in one night. The dog's share in the hunt is to scent out the trees in which the animals are feeding.

*Pseudochirus* breeds during the whole winter from May to August. I have, on one occasion, found early segmenting eggs in the last week of August, and it is possible that pregnant specimens may occasionally occur early in September. It is common enough, however, to get pseudo-pregnant females in the latter month. Having done no collecting in the summer months, I am not able to say whether there is a summer breeding-season, but, judging from statements made to me by hunters, I think it quite likely.

The female organs of *Pseudochirus* are, as might be expected, similar to those of *Trichosurus*. The lateral vaginal canals are quite conspicuous, especially during "heat," and serve for the transmission, *in coitu*, of the semen. In *Pseudochirus* also, as in *Trichosurus*, as Hill has shown †, parturition takes place through a pseudo-vaginal passage.

Detailed observations on marsupial development so far published refer almost entirely to two polyprotodont genera—*Dasyurus viverrinus* and *Didelphys virginiana*. In both of these, as shown by Hill ‡, Hill and O'Donoghue §, and Hartman ||, there is a lavish over-production of young, reduced by abnormality and mortality to more reasonable proportions. Even so, the amount of over-production is

\* Broom, R., "A Contribution to the Development of the Common Phalanger," Proc. Linn. Soc. N.S.W. 1898; see also Geoffrey Smith, 'A Naturalist in Tasmania' (Macmillan, London, 1909).

† Hill, J. P., "Contributions to the Morphology and Development of the Female Urogenital Organs in the Marsupialia.—V.," Proc. Linn. Soc. N.S.W. (1900).

‡ Hill, J. P., "On the Foetal Membranes, Placentation, and Parturition of the Native Cat (*Dasyurus viverrinus*)," Anat. Anz. vol. xviii. (1900).

§ Hill, J. P., and O'Donoghue, C. H., "The Reproduction Cycle in the Marsupial *Dasyurus viverrinus*," Quart. Journ. Micr. Sc. vol. lix. (1913).

|| Hartman, C. G., "Studies in the Development of the Opossum *Didelphys virginiana*," Journal of Morphology, vols. xxvii. and xxxii. (1916 and 1919).

remarkable enough. Hartman \* found, on one occasion, just after parturition, in the pouch of a female Virginian opossum eighteen fetuses endeavouring to accommodate themselves in a pouch which normally holds eleven; while for *Dasyurus viverrinus*, in which the pouch normally holds six teats, Hill † records two specific instances in which there were found respectively eighteen and ten fetuses just after parturition.

It is interesting to note that a similar condition of affairs appears to be normal for the rare Tasmanian polyprotodont marsupial *Sarcophilus ursinus* ("Tasmanian devil"). Up to the present I have not been able to obtain a female with developing uterine embryos; still I have been fortunate in receiving one in which ovulation had occurred but just previously. In the very much enlarged and congested uteri I found some twenty-one newly discharged ova—ten in the right and eleven in the left. It was unfortunate that these had not been fertilized, but the large number is of significance when it is remembered that, in this genus, the maximum pouch accommodation is four, and that it is not uncommon to find but two of the teats occupied.

So far such records extend only to polyprotodont marsupials, in which this feature is admittedly regarded as primitive. It is therefore somewhat surprising and interesting to find that a similar condition of affairs exists in the diprotodont *Pseudochirus cooki*.

In the ancestral condition the pouch of *Pseudochirus* is a small subcircular depression, measuring about 8 mm. in diameter. Posteriorly it is bound by a thickened ledge, while anteriorly the margin is thinner, and here the floor of the pouch is somewhat depressed below the surface and extends a few millimetres forward into the abdominal wall. Within the pouch are four teats—an anterior pair and a posterior pair. Both pairs are confined to the posterior half of the pouch. The teats of the anterior are separated by a greater lateral distance than those of the posterior—an arrangement which recalls the horseshoe-like disposition of the teats in the pouch of *Dasyurus* (Hill and O'Donoghue, 1913). The teats are all small and approximately equal in size at this stage.

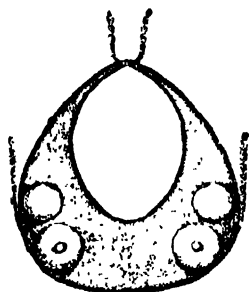
I have many specimens containing well-advanced uterine embryos, and they all agree in their pouch-features. In a representative female (*Ps. cooki*, A. 30/7/20) both uteri were

\* Hartman, C. G., "Studies in the Development of the Opossum *Didelphys virginiana*.—V. The Phenomenon of Parturition," Anat. Rec. vol. xix. (1920).

† Hill, J. P., *loc. cit.* (1900).

pregnant, and in each there were two well-advanced embryos. A sketch of the pouch, drawn to scale, is shown in the accompanying text-figure. The pouch has enlarged, and the mammary glands have undergone the usual development associated with pregnancy. There is, however, a conspicuous difference between the anterior pair and the posterior pair in this regard, the latter showing much greater development than the former. Further, while the teats of the posterior pair are quite normal, those of the anterior are extremely small, re-entrant, and sunk into depressions, so that it would be quite impossible that they could be used in lactatory processes. This is the normal condition for the pregnant female of *Pseudochirus cooki* at this stage.

In the further development towards the accommodation of



Pouch of *Pseudochirus cooki* at a fairly advanced condition of pregnancy. The unshaded elliptical area in centre represents the mouth of the pouch. At a later stage the pouch becomes produced forward on each side into a "lateral pouch" as shown.

the pouch-fetuses the posterior pair alone remains functional, while the anterior glands undergo regressive changes. In a female with pouch-young the anterior nipples are found only with the greatest difficulty, being quite minute and functionless. Here, no doubt, *Pseudochirus* shows the actual regression of pouch-structures to which Hill and O'Donoghue have drawn attention in their work on the reproductive cycle of *Dasyurus riverrinus* \*.

*Pseudochirus* exhibits, also, primitive features in respect of the number of young born. As already indicated, owing to the degeneration of the anterior pair of glands and teats the maximum pouch-accommodation can be no more than two. It is, however, very uncommon to find but two produced at

\* Hill and O'Donoghue, *loc. cit.* (1900).

one birth (extremely rarely it is one). More often there are more, the maximum number observed being six, three in each uterus. On two occasions I have found three young in the pouch, just after parturition, two of which were attached, the remaining one dead and shrivelled. In this respect, then, *Pseudochirus* exhibits a condition approximating to the primitive one so far observed only in polyprotodont forms.

With the growth of the pouch-young the marsupium increases in size and develops two lateral extensions—one on each side—which pass forward in the manner indicated by the broken line in the text-figure. Each of these extensions shelters an embryo, normally head downward.

In the process of parturition in *Pseudochirus* the distal portion of the yolk-sac, as in other marsupials (Stirling\*, Hartman†, Hill‡), remains behind in the uterus, while the proximal portion is drawn out into a long tenuous tube which can be followed by careful dissection into and along the pseudo-vaginal passage. Practically the whole of the yolk-sac, then, remains behind to be absorbed—a condition to which the term “contradeciduate” can be applied with as much justification as in the case of *Perameles*, *Dasyurus*, and *Talpa*.

Coalescence of the bilaminar omphalopleure of neighbouring embryos in the uterus of *Pseudochirus* is not uncommon, as is also recorded in the case of *Dasyurus* by Hill and for *Didelphys* by Osborne§.

Examples of true twins in marsupials appear to be rare. Patterson and Hartman|| have recently drawn attention to a case of polyembryony in the American opossum, in which four early embryos were discovered in the one blastocyst. Of these, however, only one appeared to be normal.

Bluntschli¶ has also reported a supposed case of polyembryony in *Didelphys marsupialis*, a condition which he appears to regard as normal for this species. In this case all the four embryos were normal and fairly well advanced. It

\* Stirling, E. C. “On some Points in the Anatomy of the Female Organs of Generation of the Kangaroo, etc.,” P. Z. S. 1889.

† Hartman, *loc. cit.* (1920).

‡ Hill, J. P., “The Placentation of *Perameles*,” Quart. Journ. Micr. Sc. vol. xliii. (1899).

§ Osborne, H. F., “The Foetal Membranes of the Marsupials: The Yolk-sac Placenta in *Didelphys*,” Journ. Morphology, vol. i. (1888).

|| Patterson and Hartman, “A Polyembryonic Blastocyst in the Opossum,” Anat. Rec. vol. xiii. (1917).

¶ Bluntschli, H., “Zur Entwicklungsgeschichte . . . von *Didelphys marsupialis*, etc.,” Verhandl. d. Anatom. Gesellsch. (Greifswald), Jena (1913).

is more than probable that this amounts to no more than a coalescence of the bilaminar portion of the contiguous yolk-sac walls, in spite of Bluntschli's suggestions to the contrary. In *Pseudochirus cooki* true twins occasionally occur, two embryos, each in its own amnion, being found in one blastocyst. I have as yet observed only some three cases, all of advanced embryos, but it is quite possible that close scrutiny of my early blastocyst material would yield younger examples. In all cases both embryos were normal.

This is interesting in view of the observations of Patterson and Hartman, and of the fact that *Pseudochirus* is the first diprotodont marsupial in which such an observation has been made. A full description of the relations of these twin embryos will shortly appear in another place.

It may be added that the foetal membranes of *Pseudochirus* are similar to those described for macropods. The allantois remains as a small vesicle, never coming into organic contact with the chorion. The yolk-sac circulation is quite like that described for other diprotodont marsupials.

Of Tasmanian diprotodonts I have been able to obtain fairly representative collections of intra-uterine stages and pouch-young of two kangaroo-rats—*Potorous tridactylus* and *Bettongia cuniculus*. Each of these breeds during the winter season, and is frequently found in the traps set for the catching of rabbits. Each possesses four teats in the pouch. However, but one young is produced at each birth. *Potorous* exhibits some peculiar and interesting features.

There is, for example, evidence from the number of corpora lutea that more than one ovum is extruded from the ovary at ovulation. Of these, but one develops normally, the others apparently being converted into concretionary remnants, like those found by Hartman in *Didelphys*\*.

On one occasion the examination of the uteri of a newly trapped female of *Potorous* showed that both were pregnant, a most exceptional occurrence. The uterus of the right side contained a quite young blastocyst, while in the left was a well-advanced embryo. Although this is the only case where I have known both uteri of a single female of *Potorous* to be pregnant, still, on a number of occasions, I have found an embryo or blastocyst in one uterus associated with the presence of an extremely young pouch-foetus, which had certainly been born not long before. These facts certainly show that the female of *Potorous tridactylus* is able to take the male at least twice in the same season.

\* Hartman, C. G. *loc. cit.* (1910 and 1919).

In the pouch of *Potorous* there are, as stated above, four teats. In the usual single embryo pregnancy it is found that but one of the mammary glands enlarges in preparation for the embryo, the others remaining dormant. A further curious feature is that in the majority of cases the enlarging gland corresponds in position to the pregnant uterus—for example, if one of the glands of the left side be enlarged, in all probability it will be the left uterus which is pregnant.

I am not at present able to give any extended observations on *Bettongia*. As regards the polyprotodont marsupials, they are all found to breed during the winter, usually somewhat irregularly. *Dasyurus*, however, is, in Tasmania, so far as my observations go, quite regular, its breeding-season commencing about the third week in June.

## XXVII.—On a new Race of *Bharal*.

By Lord ROTHSCHILD, F.R.S.

### *Pseudovis nahoor szechuanensis*, subsp. n.

*Pelage* (from mounted specimen).—Face-mask much browner, NOT blackish grey as in *n. nahoor*; neck, sides, and back tinged with mauve, NOT brownish; lateral black stripes less sharply marked and ceasing abruptly some 3–4 inches behind shoulder, whereas in *n. nahoor* they come forward behind and below shoulder, almost joining dark chest-patch; in the skin of the type these lateral stripes are almost absent. Remaining black markings much less strongly marked and much less well defined; in the type-skin the dark leg-markings are much reduced.

*Skull*.—Horns straighter and curved directly backwards and downwards, NOT as in typical race curved upwards to form incipient second whorl. Row of teeth more curved inwards towards the front than in the typical race.

Length of skull from foramen magnum to the pre-maxillary 217 mm.

Length of horns:—Type: right horn 447 mm. = 18½ inches; left horn 444 mm. = 17½ inches. Mounted specimen: right horn 560 mm. = 22 inches; left horn 540 mm. = 21½ inches.

Type, Shensi, *Dr. J. A. C. Smith* (Hon. N. C. Rothschild); mounted specimen, Szechuan (Rowland Ward Trustees). Both in British Museum.



XXVIII.—*Description of a new Baboon.*

By Lord ROTHSCHILD, F.R.S.

*Maimon burlacei*, sp. n.

The species is somewhat intermediate between the drill and the mandrill, and justifies the removal of the drill from the genus *Papio* to that of *Maimon*.

♂ adult.—Differs from the mandrill in the pelage being darker and the annulation of the hairs less extended and fainter. The sides of the neck and beard much more rufous, not yellow, more as in very young individuals of the mandrill, not yellow as in adult mandrill. The long yellow chest-mane of the adult mandrill is absent. The hair on the buttocks is dark brown, not silvery grey. The dull olivaceous wash of the drill is absent.

*Skull*.—Differs from drill in the crests supporting the facial callosities not being constricted, but these crests are flatter in front than in the mandrill. The short palate and short rounded nasal foramina entirely resemble these parts in the drill. It also resembles the drill in the shorter, more rounded occipital area and the shorter occipital crest.

Length of skull from foramen magnum to base of incisors 157 mm.; zygomatic breadth 119 mm.; cheek-teeth 53 mm. Mandrill: length of skull from foramen magnum to base of incisors 177 mm.; zygomatic breadth 126 mm.; cheek-teeth 53.5 mm. Drill: length of skull from foramen magnum to base of incisors 156 mm.; zygomatic breadth 127 mm.; cheek-teeth 54 mm.

*Loc.* Bityc, Ja River, Camaroons (Rowland Ward Trustees).

Type in British Museum.

XXIX.—*Preliminary Note on the Affinities of the Genus Lipotes.* By MARTIN A. C. HINTON and W. P. PYCRAFT.

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IN 1918 MILLER (Smithsonian Misc. Coll. lxviii. no. 9) described a remarkable river-dolphin inhabiting the Tung Ting Lake, about 600 miles up the Yangtze River, China. Establishing a new genus and species—*Lipotes vexillifer*—for this creature,

Miller concluded, from the somewhat meagre material \* before him, that it had closer affinities with the South-American *Inia* than with any other living genus. This view has been accepted by Winge (Vidensk. Medd. fra Dansk naturh. Foren. lxx. p. 84, 1919), who refers both *Lipotes* and *Inia* together with *Pontistes*, *Pontoporia*, *Saurodelphis*, and *Platanista*, to the family Platanistidæ. As compared with *Inia*, *Lipotes* is, according to Winge, more primitive in having more slender teeth, and less primitive in having the facial fossa relatively wider behind.

The British Museum has just received from Dr. Skinner at Hankow a most valuable and important donation—namely, a female *Lipotes* and a male *Meomeris*, both in the flesh. We are now engaged in dissecting these specimens, and hope to publish a full account of our work before long. But since the dissection of *Lipotes*, so far as it has gone, has brought to light facts which seem to have an important bearing upon the relationships of that genus, it seems advisable to publish this preliminary note.

In its external form *Lipotes* presents a certain resemblance to the Gangetic dolphin, *Platanista*, though the neck is less evident than in the latter; the blow-hole is similarly longitudinal and sinistral in position; the eyes are very small, though less reduced than in *Platanista*; the dorsal fin has the same position, although it relatively is much larger, and the general form of the flippers is not unlike in the two genera.

In dissecting the blow-hole we have found that the spiracle is guarded by a pair of large floating bones placed one on each side of the subcutaneous narial slit, and forming together its posterior lip. The inner edges of these bones are embedded in the fibrous tissue surrounding the blow-hole. Each is provided with a double retractor muscle arising from the facial crest behind, and with a protractor muscle arising from the neighbourhood of the maxillary notch. The front end of each bone is closely connected with the fibrous pad forming the anterior valve of the blow-hole, and each protractor muscle sends fibres into the sides of that pad. On retraction the floating bones, which diverge anteriorly, and the front valve all move backwards together, their opposed edges coming into close contact and tightly closing the spiracle.

\* A skull with cervical vertebrae, a photograph of the animal in the flesh, and a description of its exterior drawn up by the collector, Mr. C. M. Hoy.

Two pairs of subcutaneous air-sacs are sent off from each side of the spiracle—an anterior pair dorsal to the floating bones, and a posterior pair ventral to those structures. There is marked asymmetry between the two sides in this region. On the left side the air-sacs and the floating bone are very materially smaller than on the right, while the posterior air-sac is wholly concealed beneath the inner portion of the bone. On the right side the posterior air-sac attains an enormous development; passing out from beneath the edge of the bone, it covers the whole surface of the *dilator naris*, and in front it sends a diverticulum upwards over the dorsal surface of the bone, the end of the diverticulum actually abutting broadly against the outer wall of the anterior air-pouch. This dorsal diverticulum, although but a small part of the right posterior air-sac, has a much greater capacity than the whole pouch of the left side. In the respects described the right side appears to be much more highly modified than the left, so that we may say, perhaps, that *Lipotes* affords us two distinct stages of evolution simultaneously.

The floating bones, above described, may represent an early stage in the development of a bony facial mask, the extraordinary facial structure of *Platanista* then representing the culmination of such a process. By possessing even rudiments of such a structure *Lipotes* would be well on the way towards *Platanista*, and brought into closer relation with the latter genus than with any other. All the characters in which *Lipotes* resembles the South-American *Inia* are, perhaps, primitive features common probably to all the more primitive members of this group, and they, in all probability, were shared by the ancestors of *Platanista*.

The stomach, too, when compared with that of *Platanista*, is of very primitive form, the ventriculus being widely confluent with what represents the second compartment in *Platanista* and other dolphins. The stomach, therefore, may be described as being less completely segmented proximally than in most other genera, although towards the pylorus several small compartments are shut off as usual.

To sum up, we are inclined to believe that *Lipotes* is more closely related to *Platanista* than to any other known genus—a conclusion in harmony with its distribution,—and that it represents in many respects an early stage in the evolutionary processes which have led to the development of *Platanista*.

XXX.—*On the Morphology of the Bursate Nematode Brachyclonus indicus*, Raill. & Henry, 1910. By M. KHALIL, M.D., Ph.D., Parasitologist to the Zoological Society of London\*.

IN 1910 Railliet and Henry published a short description of *Brachyclonus indicus*, gen. et sp. n., from *Tapirus indicus*. Their description lacks many details, and, moreover, is unaccompanied by diagrams. The parasite has not been alluded to in the literature since 1910, and the original description remains the only one available for reference. During June 1922 I found this parasite in the small intestine of a Malayan tapir—*Tapirus indicus*—which died recently in the Zoological Gardens in London.

#### *The Parasite.*

*Shape of the Body.*—The body, after fixing in hot alcohol, is straight, except the cephalic end, which is strongly bent dorsally. The male is 12 mm. in length; its large bursa can be seen with the naked eye. The female is 16 mm. in length; its posterior end is conical, tapering gradually to a fine point. In both sexes the maximum diameter of the body is a little anterior to the middle of the body; it is 0.63 mm. in the female and 0.53 mm. in the male.

*Skin.*—The cuticle is finely striated at intervals of 0.006 mm. The cephalic end of the body and the female tail are devoid of striations.

*Mouth-capsule.*—The mouth-capsule opens antero-dorsally (fig. 1). Its ventral wall is longer than its dorsal wall, being respectively 0.2 mm. and 0.1 mm. in both sexes. The mouth-opening is guarded by two chitinous plates lying side by side and occupying the ventral half of that opening. The cutting-edges of the two plates lie close to each other.

The dorsal cone projects freely into the mouth-cavity nearer its dorsal wall. At its apex opens the duct of the dorsal oesophageal gland. On either side of the cone there is a lancet, pyramidal in shape. There are additional chitinous teeth springing from the floor of the mouth-capsule close to its ventral wall. These are much larger in size than the

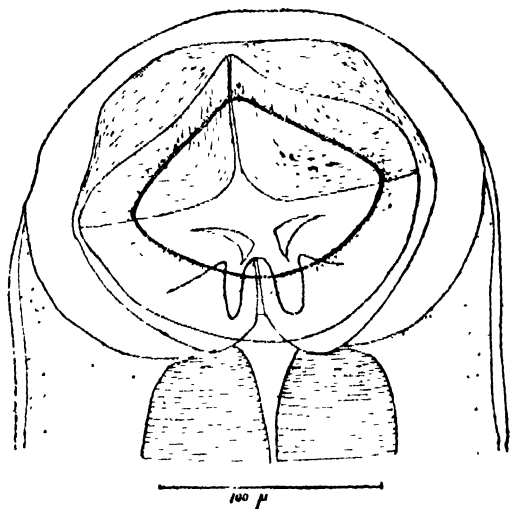
\* From the Helminthological Department, London School of Tropical Medicine.

dorsal lancet, and their apices curve dorsally approaching the dorsal lancets (fig. 2).

The mouth-opening is oval in shape, becoming angular ventrally, where its rim crosses the interval between the two chitinous plates. The ventro-dorsal diameter of the mouth-opening is 0.08 mm. and its transverse diameter is 0.12 mm.

*Œsophagus*.—The œsophagus is elongated, attaining its maximum diameter near its posterior end. The length of the œsophagus is 1.2 mm. in the female and 1.1 mm. in the male.

Fig. 1.



Dorsal view of mouth-capsule. The tips of the ventral lancets or teeth are seen in the depth of the mouth-capsule.

Its maximum diameter is 0.22 mm. and 0.17 mm. in both sexes respectively. There is a very small œsophageal funnel.

*Chyle Intestine*.—The chyle intestine is straight and is unpigmented. The rectum is a short chitinous tube, 0.15 mm. in length.

*Excretory System*.—The excretory vesicular is globular, small, and is frequently collapsed. The excretory pore is placed in the mid-ventral line a little in front of the level of

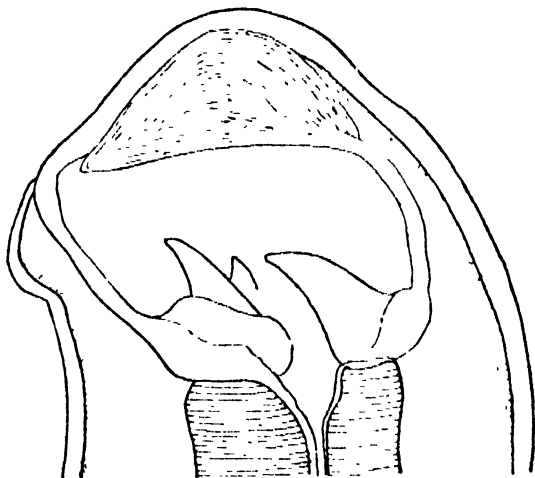
the cervical papillæ. It lies 0·64 mm. from the cephalic end in the female and 0·6 mm. in the male.

*Cervical Papillæ*.—The cervical papillæ are stout, cone-shaped, and are very short; they lie at right angles to the axis of the body, 0·65 mm. in the female and 0·62 mm. in the male from the cephalic end of the body.

*Prebursal Papillæ*.—In the male the prebursal papillæ are very prominent and long, being 0·1 mm. in length; they lie 0·75 mm. from the caudal extremity of the bursa.

*Nerve-collar*.—The nerve-collar is a thin ring surrounding

Fig. 2.



Lateral view of the mouth-capsule. The dorsal cone is seen to the left with a dorsal and a ventral tooth or lancet of one side represented.

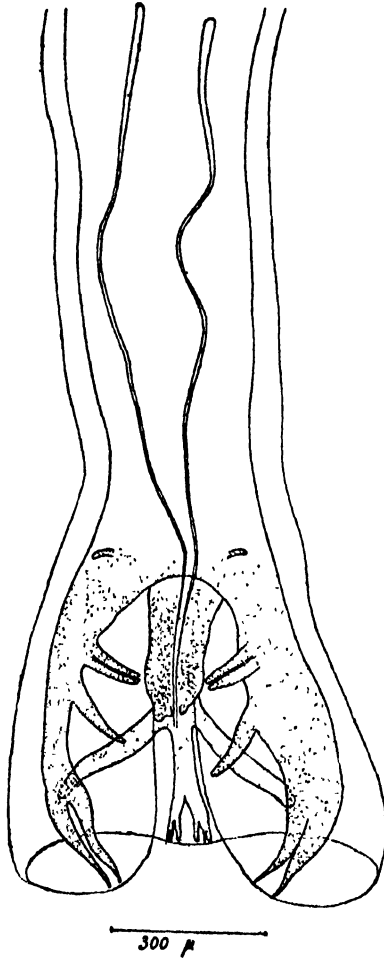
the œsophagus, 0·57 mm. in the female and ·55 mm. in the male from the cephalic end of the body.

*Genital Organs*.—The male:—the coiled testes lie mostly along the longitudinal axis of the body. There is a large spindle-shaped seminal vesicle. The cement-gland occupies practically the caudal half of the body, and is traversed by the ejaculatory duct, opening ultimately into the cloaca.

The female:—the convolutions of the ovaries lie mostly

along the longitudinal axis of the body, reaching to within 2.4 mm. of the cephalic end of the body. The divergent

Fig. 3.



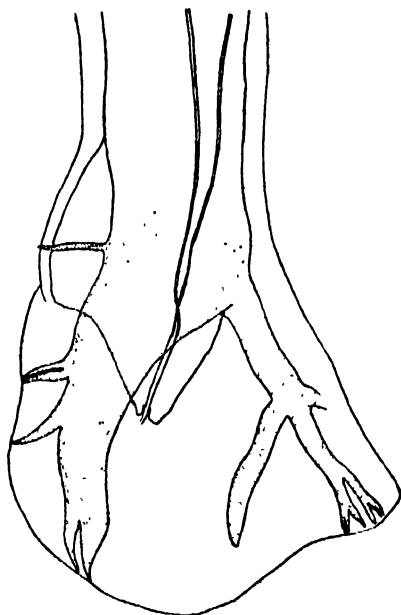
Ventral view of male bursa and spicules.

uteri lie along the axis of the body, each ending in a short weak ovijector. The vagina is very short, lying transversely

to the axis of the body and opening in the anterior half of the body 4.65 mm. from the cephalic end.

*Spicules*.—The two spicules are equal and similar; the cephalic end for 0.3 mm. is thickened, the rest of its length is filamentous and bends slightly in its course. The length of the spicule is 1.43 mm. There is no accessory piece. The spicules end in fine points.

Fig. 4.



300  $\mu$  —

Lateral view of male bursa.

*The Male Bursa*.—The bursa is not divided distinctly into lateral and dorsal lobes. It is funnel-shaped, 0.65 mm. in length and 0.72 mm. in maximum breadth. The genital cone protrudes freely into the cavity of the bursa (fig. 3). The two ventral rays are short and lie closely parallel to one another. The externo-lateral ray arises close to the ventral rays, and is widely separated from the medio-lateral and



postero-lateral rays. The common trunk of the latter two rays is only divided in its terminal half. The two rays lie close to each other; they are plumb at the seat of bifurcation, and they become suddenly constricted, terminating in fine points (fig. 4).

The externo-dorsal rays arise from the common trunk of the dorsal ray 0.2 mm. from its origin. These rays are of practically the same thickness throughout, having blunt conical

Fig. 5.

300  $\mu$ 

Fig. 6.

50  $\mu$ 

Fig. 5.—Side view of female tail.

Fig. 6.—Ova.

ends that fall considerably short of the edge of the bursa. The dorsal ray is 0.53 mm. long; it bifurcates in the terminal 0.1 mm. Each branch is tridigitate. The two lateral digitations lie close together, while the inner branch is widely separated from the rest.

*Genital Cone.*—The genital cone is elongated and is almost cylindrical when viewed from the ventral or dorsal surface. Viewed laterally it is conc-shaped. The length of the cone is

0.27 mm. Two small papillæ lie on either side of the cloacal opening.

*Female Tail*.—The posterior end of the body of the female is frequently twisted, so that the anus may be seen practically on the dorsal surface of the body. The length of the tail is 0.52 mm. (fig. 5).

*Ova*.—The ova seen in the uterus of the female measure  $60\ \mu$  in length and  $38\ \mu$  in breadth. They frequently contain two or three segments, rarely a morula (fig. 6).

*Habitat*.—Small intestine of *Tapirus indicus*, Malay States (died in London).

### Discussion.

The genus *Brachyclonus* is closely allied to *Necator*, differing from it mainly by the following:—

#### *Brachyclonus*.

Dorsal ray bifurcated near its tip.  
Externo-dorsal ray not narrowed  
at its origin.  
Spicules not barbed at their tip.

#### *Necator*.

Dorsal ray divided almost to base.  
Externo-dorsal ray narrowed at  
its origin.  
Spicules barbed at their tip.

The genus *Brachyclonus* may be defined as follows:—

### BRACHYCLONUS, Rail. & Henry, 1910.

Bunostominae. Mouth-capsule with the dorsal cone freely projecting into the mouth-cavity. Mouth-opening guarded with two chitinous plates. There are four chitinous teeth or lancets springing from the floor of the mouth—two ventral and two dorsal on either side of the dorsal cone. The caudal bursa is symmetrical. The dorsal ray divides near its end and each of its divisions is tridigitate. The externo-dorsal ray springs from the undivided trunk of the dorsal ray. The vulva is placed in the anterior half of the body.

Type-species, *Brachyclonus indicus*, Rail. & Henry, 1910.

No other species belonging to this genus has been described.

### REFERENCE.

RAILLIET & HENRY. 1910. "Quelques Helminthes nouveaux ou peu connus du groupe des Bunostomiens." Bull. de la Soc. de Pathologie Exotique, tome iii. no. 5.

XXXI.—On *Oswaldocruzia wisei*, a new Nematode from the  
 “Saki” Monkey. By F. PHILPOT, M.Sc.\*

A FEW specimens of a small bursate nematode, sent to Professor Leiper by Dr. Wise, now Surgeon-General of Trinidad, were collected from the “sackawinkie” monkey in British Guiana, belong apparently to an undescribed species of the genus *Oswaldocruzia*, Travassos, which has hitherto been recorded only from reptilian and amphibian hosts.

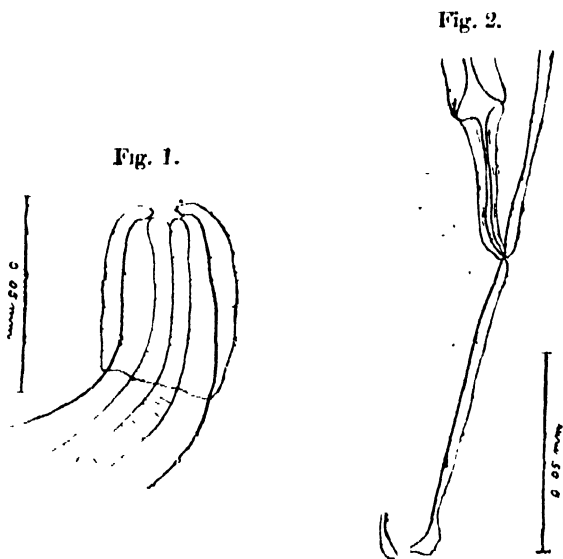


Fig. 1.—Head of female.

Fig. 2.—Tail of female.

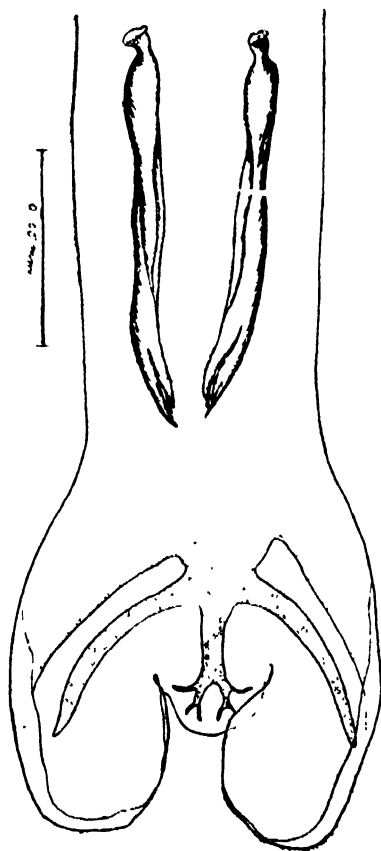
The parasites are very small, delicate forms, the female measuring 9.8 mm. by 0.06 mm., the male 6.4 mm. by 0.05 mm. The head is surrounded by a cuticular collar of equal diameter throughout its length and showing transverse markings; in the female it measures 0.047 mm. long by 0.035 mm. broad, in the male 0.043 mm. long by 0.029 mm. broad. The mouth-aperture is simple, surrounded by three

\* From the Helminthological Department, London School of Tropical Medicine.

small lips. The cuticle of the body shows very fine transverse striations.

*Female*.—The anterior end of the body is tapering and curved. The excretory pore lies at a distance of 0.193 mm. from the anterior end of the body, just behind the nerve-ring.

Fig. 3.



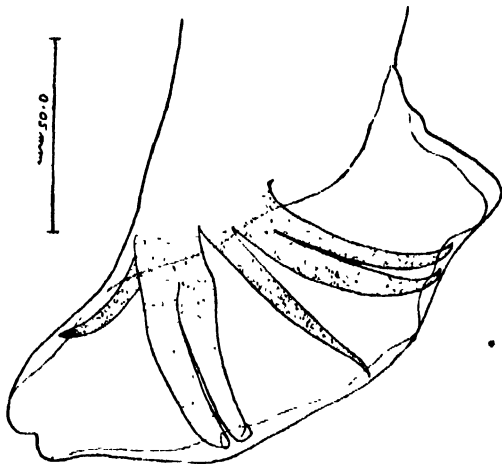
Male bursa, dorsal view.

The vulva is transverse, without prominent lips, lying 1.9 mm. from the posterior end. The ovijectors are strongly developed, the uteri divergent, containing thin-shelled segmented eggs, which measure  $0.028 \times 0.051$  mm. Posteriorly the body

is cut off almost transversely, and bears a delicate cuticular spine; the anus is 0.092 mm. from the end of the spine.

*Male.*—The bursa is trilobed, the lateral lobes measuring in side-view about 0.15 mm. broad by 0.054 mm. long; the median dorsal lobe is small and triangular. The ventro-ventral and ventral rays lie close together and are approximately of equal thickness; the externo-lateral is separate, thinner than the ventrals, and directed outwards; the median and postero-lateral are close, equal in thickness to the ventrals,

Fig. 4.



Male bursa, lateral view.

and directed outwards. The externo-dorsal arises from the base of the dorsal, and does not quite reach the edge of the bursa. The dorsal ray is broad at the base, becoming narrower after the origin of the externo-dorsal; near the distal end it bifurcates, each ray giving rise to three branches. The spicules measure 0.106 mm. long, are twisted, divided into four branches at the distal end; there is no accessory piece.

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## BIBLIOGRAPHICAL NOTICE.

*Practical Zoology for Medical and Junior Students.* By J. D. F. GILCHRIST and C. VON BONDE. Pp. xi+329, 105 text-figures. Edinburgh: E. and S. Livingstone, 1922. Price 15s. net.

THIS book is intended for students of elementary zoology, and, as it is designed especially for use in South Africa, it includes directions for the study not only of animals commonly used in laboratories in this country, but also of certain South African types. Each alternate page is left blank for the reception of the student's notes and drawings. The numerous illustrations are, with few exceptions, original, and are clear and well reproduced.

The treatment is on strictly traditional lines, and the work is more likely to be useful in South Africa than in this country, where it is hardly likely to displace the well-tried text-books now in use. Only two South African types are described in detail—namely, the crawfish, *Jasus*, and the platana, or clawed toad, *Xenopus*. In the accounts of these we find some very surprising statements indeed. For instance, it is stated that in *Jasus* there are no appendages on the last abdominal somite (p. 94), and the antennule of the same animal is described as follows:—"The protopodite is two jointed, the endopodite is a single two-jointed rod terminating in two small flagella, and the exopodite is absent" (p. 102).

## PROCEEDINGS OF LEARNED SOCIETIES.

## GEOLOGICAL SOCIETY.

April 12th, 1922.—Prof. A. C. Seward, Sc.D., F.R.S., President, and afterwards Dr. H. H. Thomas, V.P.G.S., in the Chair.

The following communications were read:—

1. 'On a Collection of Carboniferous Plants from Peru.' By Albert Charles Seward, Sc.D., F.R.S., Pres.G.S.

The plants described by the Author were collected by Mr. J. A. Douglas in 1911 from coal-bearing strata on the south side of the Peninsula of Paracas, a few miles south of Pisco on the coast of Peru. Although the specimens are few in number and for the greater part fragmentary, they are of considerable interest: they demonstrate the occurrence on the coast of Peru of Carboniferous strata; whether the plants should be referred to an Upper or a Lower horizon is not certain. Hitherto no fossiliferous Palæozoic rocks have been recorded from the Peruvian coast.

2. 'The Geological History of the Genus *Stratiotes*: an Account of the Evolutionary Changes which have occurred within the Genus during the Tertiary and Quaternary Eras.' By Miss Marjorie Elizabeth Jane Chandler. (Communicated by Mrs. E. M. Reid, B.Sc., F.L.S., F.G.S.)

*Stratiotes*, a monotypic genus of European and West Asian water-plants, is the descendant of a line of ancestors which can be traced back to the Eocene. The seeds have long been known in the fossil state as *Folliculites*, *Paradoxocarpus*, etc., but their relationship with *Stratiotes* was not recognized until 1896. For many years the subject was in hopeless confusion, because the species were ill-defined and the types and type-localities lost or inadequately studied.

The recent seed is first investigated, and an account then given of the modifications which have occurred in the genus since the Eocene Period. Nine species are described or redefined, of which *S. aloides* alone is still living. Seven of them appear to constitute links in an evolutionary chain which terminates in the recent plant, while two perhaps represent a branch-line of evolution, distinguished by certain peculiarities of form and raphe.

As the fossil species occur in great abundance, and as several of them are widespread geographically, while each seems to have a limited range in time, there is a hope that *Stratiotes* may prove of value in the correlation of isolated freshwater deposits in Europe.

May 10th, 1922.—Prof. A. C. Seward, Sc.D., F.R.S.,  
President, in the Chair.

The following communications were read:—

1. 'The Lower Carboniferous Succession in the Settle District and along the line of the Craven Faults.' By Prof. Edmund Johnston Garwood, Sc.D., F.R.S., V.P.G.S., and Miss Edith Goodyear, B.Sc., F.G.S.

For some years past the problem presented by the marked change in the character of the Lower Carboniferous rocks in the neighbourhood of the Craven Faults has attracted the attention of geologists. This change was attributed by the late Mr. R. H. Tiddeman to faulting along the line of the Craven Faults during the deposition of the beds, while Prof. J. E. Marr has suggested that the special 'knoll-reef' structures characteristic of the beds lying south of the faults, are the result of earth-movements of post-Carboniferous date. An essential feature of the problem is the marked and sudden change in the character of the faunas, in the neighbourhood of the Middle Craven Fault, east of Settle. The present communication records an attempt to solve the problem by the method of detailed mapping of definite faunal horizons.

Two distinct facies can be recognized in the district, which may be denominated the North Country type and the South Country type respectively. The standard succession adopted for the North Country type is the zonal sequence already established for West-

morland, the South Country type being represented by the 'knoll-reef' limestone, Pendleside Series, and Bowland Shales.

The district surveyed includes the area between the Dent Fault and the valley of the Wharfe, south of a line drawn east and west through Ribbleshead. Starting from this line, the northern facies has been traced to its southernmost limit, and the exact position, where the change to the southern facies takes place, has been ascertained. The results may be summarized as follows:—

(1) The whole of the country north of the North Craven Fault belongs to the North Country type, and includes the general succession between the *Michelinia* Zone and the Main or Great Limestone. The district was submerged considerably later than the Shap-Ravenstonedale area, the submergence over the greater part of the district not occurring until the *Nematophyllum-minus* sub-zone was being laid down. The beds, as a whole, show a deeper-water origin than those of corresponding horizons in Westmorland. This is especially noteworthy in the case of the Lower *Dibunophyllum* sub-zone. There is no Bryozoa Band, but the Porcellaneous Bed which also occurs at that horizon is taken as the base of D<sub>1</sub>. The Main Limestone, too, is much less fossiliferous than is the case in Wensleydale. Both the *Cyrtina-septosa* Band and the *Gireanella* Nodular Band are well developed, and constitute admirable horizons for mapping. A second Nodular Band occurs in the Lower *Lonsdaleia* Bed, which has a wide geographical range; it is due to a special organic structure, and may be correlated with the Oxford Limestone of Northumberland. The horizon of the Hardraw Shale is characterized by *Productus pugilis* round Ingleborough and by *Posidonomya becheri* in Wensleydale. The specimens of the latter fossil found at Budle in Northumberland probably occur at this horizon.

(2) The strip of country between the faults belongs also, as a whole, to the North Country type, and marks the southern margin of the North-Western Province. The *Orionastræa* Band forms an important horizon here, and represents the summit of the Hardraw-Scar Limestone round Ingleborough; below it occurs a Bryozoa-Band characterized by *Athyris lamellosa* which, near Malham, contains a special fauna with *Codaster*, cup-corals and trilobites. The area is traversed by numerous normal faults trending usually north-westwards and south-eastwards; but, near Ingleton, the beds are repeated on themselves by thrusts. Dolomitization occurs in connexion with the faulting, and secondary quartz-crystals have developed in the limestone near planes of movement, and in association with the unconformity.

(3) At three places, between the faults, patches of rock occur, belonging to the South Country type. In Meal-Bank Quarry (Ingleton) a wedge-shaped mass of coal and shale occurs in limestone of D<sub>1</sub> age, and immediately east of Settle 'knoll-reef' limestone with characteristic fossils occupies the southern slopes of High Hill; while at Bordley occurs an extensive outlier of Bowland Shale, against which several horizons, belonging to the northern facies, terminate abruptly with discordant dip and strike.



The change in the faunas is everywhere accompanied by a lithological change. This change is always abrupt, and usually takes place along the line of the Middle Craven Fault; but, even where the southern facies occurs in the strip between the faults, the change is equally sudden. There is no gradual transition anywhere between the northern and the southern facies, and there is no evidence that the change was influenced by faulting during Lower Carboniferous times.

(4) The 'knoll-reef' limestone undoubtedly represents a special type of deposit, as suggested by Tiddeman; but quaquaversal dips have been developed in beds belonging to different horizons, and Prof. Marr's contention is borne out by the occurrence of 'knolls' in the northern succession in the neighbourhood of the faults, notably at Greenhow, Coldstones, and Toft Gate, where the *Cyrtina* Band, the Lower *Lonsdalia* Bed, and the *Orionastræa* Band have been folded into three separate domes along the northern margin of the North Craven Fault.

The Authors suggest that the two facies were laid down some distance apart, that they have been brought together by thrusting, that the patches of rock belonging to the southern type, which lie between the faults, are portions of an overthrust mass from the south which have escaped denudation, and that the Middle Craven Fault is a normal fault which took place subsequent to the thrusting.

2. 'The Miocene of Ceylon.' By Edward James Wayland, Assoc.R.C.S., F.G.S., and Arthur Morley Davies, D.Sc., Assoc. R.C.S., F.G.S.

Arenaceous and calcareous strata of Miocene age are found (1) over an extensive area in the north and north-west of Ceylon, from the Jaffna Peninsula in the extreme north to Puttalam in lat. 8° N., and (2) in a small part of the southern coast, at Miniagalkanda. At the latter place the beds are seen to rest upon Archæan rocks; but in the former area the base is not seen, and higher horizons are represented. The whole series appears to constitute a cycle of sedimentation, beginning and ending with areno-argillaceous deposits, and consisting mainly of fossiliferous limestones.

The fossils consist of foraminifera, corals, echinoids, and molluscs. The last are largely in the form of casts, exact identification of which is difficult; but they show close relations to the fossils from Kach and Sind figured by Sowerby, and A. d'Archiac and Haime, and also to recent Indo-Pacific forms. The lower horizon of Miniagalkanda is characterized by *Ostræa virleti* Deshayes, and is dated as Vindobonian (probably Tortonian); while the higher horizon of the northern area contains *Orbiculina malabarica* Carter, and may possibly be Pontian. The transgression of the sea on the continental area of Southern India and Ceylon is thus contemporaneous with its recession from the Himalayan geosyncline, in accordance with Haug's principle.

# THE ANNALS

## AND

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XXXII.—*The Classification of the Fishes of the Family Cichlidæ.*—II. *On African and Syrian Genera not restricted to the Great Lakes.* By C. TATE REGAN, M.A., F.R.S.

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SINCE my paper on the Tanganyika Cichlidæ (Ann. & Mag. Nat. Hist. (9) v. 1920, p. 33), I have published revisions of those of Lakes Edward and Kivu (Ann. & Mag. Nat. Hist. (9) viii. 1921, p. 632), of Nyassa (P. Z. S. 1921, p. 675), of L. Victoria (P. Z. S. 1922, p. 157), and of Madagascar (Ann. & Mag. Nat. Hist. (9) v. 1920, p. 422). There remain the Syrian and African Cichlids outside the Great Lakes, and it is the object of the present paper to give some account of these.

#### *Synopsis of the Genera.*

I. Articular surface for upper pharyngeals formed by parasphenoid, or parasphenoid and prootics; scales cycloid or feebly denticulate.

A. Pharyngeal apophysis, when distinct, longitudinally compressed, with transverse articular surface.

1. Teeth usually not conical.

Outer teeth bicuspid, inner tricuspid (some or all sometimes conical in adults of certain species); lower pharyngeal subtriangular . .

1. *Tilapia.*

Teeth setiform, with expanded tips, forming very broad bands; lower pharyngeal spoon-shaped.

2. *Chilochromis.*

*Ann. & Mag. N. Hist. Ser. 9. Vol. x.*

2. Teeth conical or cuspidate, in 3 to 5 series; frontal region humped; maxillary exposed ..... 3. *Cyphotilapia*.
3. Teeth conical.
- a. Occipital crest not extending forward to anterior end of interorbital region.
- a. Upper lateral line well separated from dorsal fin.
- Fourth vertebra with inferior apophyses; lower jaw strongly projecting ..... 4. *Parachromis*.
- Third vertebra with inferior apophyses; lower jaw not or scarcely projecting ..... 5. *Pelmatochromis*.
- β. Upper lateral line contiguous to dorsal fin.
6. *Nannochromis*.
- b. Occipital crest extending forward in advance of interorbital region; teeth small, forming broad bands.
7. *Heterochromis*.
- B. Pharyngeal apophysis strong, ending in a flat triangular or ovate articular surface; teeth conical; lower lateral line long.
8. *Tylochromis*.
- II. Articular surface for upper pharyngeals formed by parasphenoid in the middle and basioccipital at sides.
- A. Three anal spines.
1. Teeth conical or compressed, with or without cusps, not incisor-like.
- a. Third vertebra with inferior apophyses.
- Teeth conical, mainly uniserial; middle pairs more or less enlarged; maxillary narrow, curved ..... 9. *Hemichromis*.
- Teeth in 2 or more series, conical or compressed, unicuspid, or outer bicuspid and inner tricuspid ..... 10. *Haplochromis*.
- b. Fourth vertebra with inferior apophyses.
- Apophyses of fourth vertebra united below; pharyngeal teeth stout, blunt ..... 11. *Sargochromis*.
- Apophyses of fourth vertebra small, paired; pharyngeal teeth slender ..... 12. *Serranochromis*.
2. Teeth incisor-like, rather broad, entire or slightly notched.
13. *Steatochromis*.
- B. Four or more anal spines; strong anterior canines.
14. *Lamprologus*.

### 1. *TILAPIA*, A. Smith, 1840.

Regan, Ann. & Mag. Nat. Hist. (9) v. 1920, p. 37.

This genus includes about 50 species from Africa and Syria; it corresponds to Boulenger's section I. (scales cycloid or feebly denticulate), with the following exceptions:—

1. *T. auromarginata* (*Otopharynx*).
2. *T. ovalis* (= *Haplochromis moffuti*).

3. *T. steindachneri* (= *Sargochromis mellandi* + *Haplochromis acuticeps*).
4. *T. woosnami* (= *Haplochromis smithii*).
5. *T. jallæ*.
6. *T. humilis*.

I have not seen examples of the last two species, but probably they should be placed in *Haplochromis*.

Since the publication of Boulenger's Catalogue a number of species have been described from South Africa by Gilchrist and Thompson (Ann. S. Afric. Mus. xi.).

Of these *T. swierstræ*, *mackeani*, *sykesii*, *druryi*, and *kirkhami* appear to be nearly related to each other and to *T. melanopleura*; *T. intermedia* and *T. sheshekensis* may be synonyms of *T. andersonii*, and *T. arnoldi* may be a synonym of *T. natalensis*. *T. adolfi*, Steind. (Denkschr. Akad. Wien, cxii. 1916, p. 82, pl. v.), from E. Africa, does not seem to be distinct from *T. nilotica*.

## 2. CHILOCHROMIS, Bouleng., 1902 (type *C. duponti*, Bouleng.).

Differs from *Tilapia* in the dentition, in the pharyngeals, which are formed as in *Cyathopharynx*, and in the pharyngeal apophysis, which appears to have the same structure as in *Otopharynx*.

A single species from Portuguese Congo.

## 3. CYPHOTILAPIA, Regan, 1920 (type *Paratilapia frontosa*, Bouleng.).

Regan, Ann. & Mag. Nat. Hist. (9) v. p. 43.

Two species: one from Tanganyika, the other from the Upper Congo.

## 4. PARACHROMIS, gen. nov. (type *Henichromis sacer*, Günth.).

Articular surface for upper pharyngeals formed by parasphenoid only. Vertebrae 29; fourth with a pair of apophyses which unite below. Mouth terminal; lower jaw strongly projecting; teeth in jaws conical, in 2 to 4 series, outer largest; pharyngeal teeth conical, the middle ones rather strong and blunt. Scales cycloid (30-32). Dorsal XIV 10-11. Anal III 8-9.

A single species from the Lake of Galilee.

5. PELMATOCHROMIS, Steind., 1894  
(type *P. buettikoferi*, Steind.).

Articular surface for upper pharyngeals formed by parasphenoid only. Vertebrae 25 to 27; third with apophyses which unite below. Mouth terminal; lower jaw not or but little projecting; teeth conical, in 2 or more series. Scales cycloid. Dorsal XIII-XVIII 7-12. Anal III 6-9.

Congo and West Africa.

In addition to species 4 to 21 of Boulenger's Catalogue, this genus includes:—

*Paratilapia cerasogaster*, Bouleng.

„ *dorsalis*, Pellegr.

„ *corbali*, Bouleng.

„ *thomasi*, Bouleng.

„ *longipinnis*, Nichols & Griscom (? = *P. nigrofasciatus*).

? *Hemichromis schwebischi*, Sauv.

I suspect that the last may be a *Pelmatochromis* related to *P. guentheri*.

6. NANNOCHROMIS, Pellegr., 1904.

Scarcely distinct from *Pelmatochromis*.

Three species from the Congo.

7. HETEROCHROMIS, gen. nov.  
(type *Paratilapia multidentis*, Pellegr.).

Pharyngeal apophysis formed by parasphenoid. Occipital crest very strong, extending forward in advance of inter-orbital region. Jaws with broad bands of small conical teeth. Pharyngeal teeth conical, those in the middle strong and blunt. Scales more or less distinctly denticulate, large (29-30). Dorsal XIV 14-15. Anal III 8-9.

A single species from the Congo, which is well distinguished from all other African Cichlidæ by the dentition, the shape of the head, the scaly soft dorsal and anal fins, and the separation of the lateral lines by three rows of scales. *Paratilapia xenodon*, Nichols & Griscom, is a synonym.

8. **TYLOCHROMIS**, Regan, 1920  
(type *Pelmatochromis jenlinki*, Steind.).

One species from Tanganyika and seven from the Congo and West Africa (cf. Regan, Ann. & Mag. N. H. (9) v. 1920, p. 163).

9. **HEMICHROMIS**, Peters, 1857  
(type *H. fasciatus*, Peters).

This genus, with 2 species from Africa, differs slightly from *Huplochromis* in the dentition and in the structure of the maxillary.

10. **HAPLOCHROMIS**, Hilgend., 1888  
(type *H. obliquidens*, Hilgend.).

Regan, P. Z. S. 1922, p. 160.

Numerous species in Victoria and Nyassa; the species not peculiar to the Great Lakes all belong to the subgenus *Ctenochromis*, Pfeffer, with an outer series of bicuspid or conical teeth and one or more inner series of tricuspid or conical teeth. They may be arranged as follows:—

I. S. Africa (Zambesi and southwards).

A. Soft dorsal with 12–15 rays; pharyngeal teeth obtusely conical.

1. Depth of præorbital not greater than diameter of eye.

Scales on chest rather small; 6 scales between

pectoral and pelvic fins ..... 1. *giardi*.

Scales on chest larger; 3 or 4 between pectoral and

pelvic fins ..... 2. *gibbiceps*.

2. Depth of præorbital a little greater than diameter of eye.

3. *smithii*.

3. Depth of præorbital much greater than diameter of eye.

4. *frederici*.

B. Soft dorsal with 8 to 12 rays.

1. 6 or 7 series of scales on cheek.

Caudal truncate ..... 5. *jallæ*.

Caudal rounded ..... 6. *humilis*.

2. 3 to 5 series of scales on cheek.

a. Maxillary extending to between nostril and eye; caudal peduncle longer than deep ..... 7. *acuticeps*.

b. Maxillary about reaching vertical from anterior edge of eye.

a. 32 scales in a longitudinal series; caudal peduncle longer than deep.

Pharyngeal teeth of 2 median series strong, sub-conical; rest small, compressed, hooked ..... 8. *multiocellatus*.

Lower pharyngeal with a group of stout, blunt teeth ..... 9. *darlingi*.

$\beta$ . 26 to 30 scales in a longitudinal series; caudal peduncle not longer than deep.

Scales on chest rather small; 5 or 6 scales between pectoral and pelvic fins ..... 10. *swynnertoni*.

Scales on chest larger; 3 or 4 (rarely 5) scales between pectoral and pelvic fins ..... 11. *moiffati*.

## II. Congo.

A. 4 or 5 scales from origin of dorsal to lateral line.

10-13 gill-rakers on lower part of anterior arch.

D. XIV-XVI 10-11. A. III 6-7 ..... 12. *fasciatus*.

7 or 8 gill-rakers on lower part of anterior arch.

D. XV-XVI 8-10. A. III 7 ..... 13. *stigmatogenys*.

7 gill-rakers on lower part of anterior arch. D. XII 9.

A. III 6 ..... 14. *oligacanthus*.

B. 6 or 7 scales from origin of dorsal to lateral line; 10-12 gill-rakers on lower part of anterior arch. D. XV-XVII 8-10. A. III 7-8. Cheek covered with scales.

15. *moeruensis*.

C. 8 or 9 scales from origin of dorsal to lateral line; 10 gill-rakers on lower part of anterior arch. D. (XVI) XVII-XIX 8-9. A. III 7-8. Lower part of cheek naked.

16. *polyacanthus*.

## III. North and East Africa; Syria.

A. Caudal peduncle much longer than deep .. 17. *fuellborni*.

B. Caudal peduncle about as long as deep.

1. Lower part of cheek naked ..... 18. *pectoralis*.

2. Cheek covered with scales.

a. 3 or 4 scales between pectoral and pelvic fins; teeth in 3 or 4 series.

30 scales in a longitudinal series ..... 19. *giglioli*.

25 to 28 scales in a longitudinal series ..... 20. *multicolor*.

b. 5 to 9 scales between pectoral and pelvic fins.

a. Pharyngeal teeth small and compressed, the middle ones sometimes larger and subconical.

Teeth in 2 series. D. XIII-XV 9-10. A. III

8-9. 29 or 30 scales in a longitudinal series .. 21. *bloyeti*.

Teeth in 3 or 4 series. D. XIV-XV 10. A. III

8-10. 30 scales in a longitudinal series ..... 22. *wingatii*.

Teeth in 3 or 4 series. D. XIV-XVI 10-11. A.

III 9-11. 31 to 34 scales in a longitudinal series ..... 23. *desfontainesii*.

$\beta$ . Middle pharyngeal teeth stout and blunt.

Teeth in 2 or 3 series. D. XIV 9. A. III 8. 28

scales in a longitudinal series ..... 24. *flavii-josephi*.

## 1. *Haplochromis giardi*, Pellegr., 1904.

*Tilapia giardi*, Bouleng. Cat. Afr. Fish. iii. p. 221, fig. 144.

*Paratilapia carlottæ*, Bouleng. t. c. p. 353, fig. 239.

Total length 255 mm.; three specimens examined.  
Zambesi.

2. *Haplochromis gibbiceps*, Bouleng., 1911.

*Paratilapia gibbiceps*, Bouleng. Cat. Afr. Fish. iii. p. 354, fig. 240.

Total length 200 mm.; types examined.

L. Ngami Basin.

3. *Haplochromis smithii*, Casteln., 1861.

*Tilapia woosnami*, Bouleng. Cat. Afr. Fish. iii. p. 212, fig. 137.

*Paratilapia smithii*, Bouleng. t. c. p. 367, fig. 242.

*Pelmatochromis robustus*, Gilchr. & Thomp. Ann. S. Afric. Mus. xi. 1918, p. 538, fig. 154.

Total length 277 mm.; four specimens, including the type of *T. woosnami*.

L. Ngami Basin and Southern Rhodesia.

4. *Haplochromis frederici*, Casteln., 1861.

*Paratilapia frederici*, Bouleng. Cat. Afr. Fish. iii. p. 355, fig. 241.

Total length 210 mm.; two specimens examined.

L. Ngami Basin.

5. *Haplochromis jallæ*, Bouleng., 1896.

*Tilapia jallæ*, Bouleng. Cat. Afr. Fish. iii. p. 213.

Total length 75 mm.

Upper Zambesi.

6. *Haplochromis humilis*, Steind., 1866.

*Tilapia humilis*, Bouleng. Cat. Afr. Fish. iii. p. 213.

Total length 115 mm.

Angola.

7. *Haplochromis acuticeps*, Steind., 1866.

*Tilapia steindachneri* (part.), Bouleng. Cat. Afr. Fish. iii. p. 209.

*Tilapia acuticeps* (part.), Bouleng. t. c. p. 218, fig. 141.

*Tilapia lucuila*, Bouleng. t. c. p. 224, fig. 146.

? *Tilapia ramsayi*, Gilchr. & Thomps. Ann. S. Afric. Mus. xi. 1918, p. 601, fig. 129.

Depth of body 3 to  $3\frac{1}{2}$  in the length, length of head about 3. Snout with straight or slightly convex profile, once to  $1\frac{1}{2}$  diameter of eye, which is  $3\frac{1}{2}$  to  $4\frac{1}{4}$  in length of head, equal to or greater than depth of præorbital or cheek; interorbital with  $4\frac{1}{2}$  to 5 in length of head. Jaws equal



anteriorly; maxillary extending to between nostril and eye; an outer series of bicuspid teeth, followed by 1 or 2 series of smaller tricuspid teeth; 30 to 50 teeth in outer series of upper jaw. 3 to 5 series of scales on cheek. 8 to 10 gill-rakers on lower part of anterior arch. Pharyngeal teeth small, compressed, hooked. Scales cycloid or finely denticulate, 30 to 33 in a longitudinal series, 4 or 5 from origin of dorsal to lateral line, 6 to 8 between pectoral and pelvic fins. Dorsal XIV–XVI 9–12; last spine  $\frac{1}{2}$  to  $\frac{2}{3}$  length of head. Anal III 7–9; third spine stronger than and as long as last dorsal. Pectoral  $\frac{3}{4}$  to  $\frac{2}{3}$  head, not reaching anal. Caudal rounded. Caudal peduncle  $1\frac{1}{2}$  to  $1\frac{1}{2}$  as long as deep. Greyish; an opercular spot; soft dorsal and caudal with series of small spots.

Angola. Zambesi?

Seven specimens, 70 to 125 mm. in total length, from the Luculla and Que Rivers.

#### 8. *Haplochromis multiocellatus*, Bouleng.

*Pelmatochromis multiocellatus*, Bouleng. Cat. Afr. Fish. iii. p. 409, fig. 279.

Very near *H. darlingi*, differing as follows:—Pharyngeal teeth small, compressed, hooked, only those of the 2 median series enlarged, stout, subconical. Pectoral  $\frac{3}{4}$  length of head. Caudal peduncle only slightly longer than deep.

Luculla River, Angola.

The type measures 120 mm. in total length.

#### 9. *Haplochromis darlingi*, Bouleng.

*Pelmatochromis darlingi*, Bouleng. Cat. Afr. Fish. iii. p. 410, fig. 280.

*Paratilapia arnoldi*, Gilchr. & Thomps. Ann. S. Afric. Mus. xi. 1918, p. 521.

Depth of body  $2\frac{2}{3}$  to 3 in length, length of head about 3. Snout a little longer than diameter of eye, which is  $3\frac{1}{2}$  in length of head, greater than præorbital depth, about equal to depth of cheek; interorbital width  $4\frac{1}{2}$  to 5 in length of head. Jaws equal anteriorly; maxillary extending to vertical from anterior edge of eye; teeth conical, triserial, 50 to 60 in outer series of upper jaw. 4 series of scales on cheek. 7 to 10 gill-rakers on lower part of anterior arch. Middle pharyngeal teeth stout and obtuse. Scales cycloid or feebly denticulate, 32 in a longitudinal series, 4 from origin of dorsal to lateral line, 6 between pectoral and pelvic fins.

Dorsal XIV-XVI 11-12; last spine from less than  $\frac{2}{3}$  to nearly  $\frac{1}{2}$  length of head. Anal III 7-8; third spine stronger and as long as or a little shorter than last dorsal. Pectoral  $\frac{2}{3}$  to  $\frac{4}{5}$  head, reaching vent or origin of anal. Caudal subtruncate. Caudal peduncle  $1\frac{1}{4}$  to  $1\frac{1}{2}$  as long as deep. Dark cross-bars on body; vertical fins spotted.

N.E. Rhodesia.

The type and four specimens of 110 to 125 mm. received as *P. arnoldi*.

#### 10. *Haplochromis swynnertoni*, Bouleng., 1907.

*Tilapia swynnertoni*, Bouleng. Cat. Afr. Fish. iii. p. 219, fig. 142.

Very near *H. moffati*, differing as follows:—Scales on chest smaller, 5 or 6 between pectoral and pelvic fins; 15 dorsal spines; pectoral  $\frac{2}{3}$  length of head; caudal subtruncate instead of fully rounded; males with 2 to 4 ocelli on anal fin. This species is still closer to *H. callipterus*, Günth., of L. Nyassa and to *H. burtoni*, Günth., of Tanganyika. It differs from *H. bloyeti*, Sauv., of Tanganyika Territory, principally in having 4 series of teeth.

Buzi R., Portuguese E. Africa.

The types measure 85 to 95 mm. in length.

#### 11. *Haplochromis moffati*, Casteln., 1861.

*Tilapia ovalis* (Steind., 1866), Bouleng. Cat. Afr. Fish. iii. p. 208, fig. 133.

*Haplochromis moffati*, Bouleng. t. c. p. 300, fig. 204.

*Paratilapia hiebberti* (Hilgond., 1902), Bouleng. t. c. p. 350.

Depth of body  $2\frac{1}{3}$  to 3 in length, length of head  $2\frac{2}{3}$  to nearly 3. Snout as long as or longer than diameter of eye, which is  $3\frac{1}{2}$  to 5 in length of head, equal to or greater than præorbital depth, in adult less than depth of cheek; interorbital width 4 to 5 in length of head. Jaws equal or lower projecting; maxillary about reaching vertical from anterior edge of eye; teeth conical or cuspidate, in 3 to 5 series, 36 to 60 in outer series of upper jaw. 3 to 5 series of scales on cheek. 7 to 10 gill-rakers on lower part of anterior arch. Pharyngeal teeth small. Scales cycloid or denticulate, 26 to 30 in a longitudinal series, 3 to 5 from origin of dorsal to lateral line, 3 or 4 (rarely 5) between pectoral and pelvic fins. Dorsal XIII-XV 9-11; last spine  $\frac{1}{2}$  to  $\frac{1}{3}$  length of head. Anal III 8-10. Pectoral shorter

than head, not reaching anal. Caudal rounded. Caudal peduncle as long as deep. Body with or without dark cross-bars; sometimes a lateral band; an opercular spot; a bar across præorbital; vertical fins usually spotted; dorsal dark-edged.

South Africa to Katanga and Rhodesia.

Numerous examples up to 120 mm. in total length.

12. *Haplochromis fasciatus*, Perugia, 1902.

*Tilapia fasciata*, Bouleng. Cat. Afr. Fish. iii. p. 215, fig. 139.

? *Paratilapia toddi*, Bouleng. t. c. p. 327.

Total length 105 mm. The type of *P. toddi* measures 150 mm.

Lower Congo: Kasai R.?

13. *Haplochromis stigmatogenys*, Bouleng., 1913.

*Tilapia stigmatogenys*, Bouleng. Cat. Afr. Fish. iii. p. 226, fig. 148.

Total length 105 mm.

Upper Congo.

14. *Haplochromis oligacanthus*, sp. n.

Depth of body 3 in length, length of head  $2\frac{3}{4}$ . Snout shorter than diameter of eye, which is 3 in length of head, twice præorbital depth, and  $1\frac{1}{2}$  interorbital width. Jaws equal anteriorly; maxillary extending to below anterior edge of eye; teeth cuspidate, in 3 or 4 series; 46 in outer series of upper jaw. 5 series of scales on cheek. 7 gill-rakers on lower part of anterior arch. 28 scales in a longitudinal series, 4 from origin of dorsal to lateral line, 8 between pectoral and pelvic fins. Dorsal XII 9; last spine  $\frac{1}{3}$  length of head. Anal III 6. Pectoral  $\frac{3}{4}$  head. Caudal rounded, subtruncate. Caudal peduncle deeper than long. Dark cross-bars and an interrupted lateral band; an opercular spot; a blackish vertical bar below anterior part of eye, broadening on lower jaw; series of small spots on soft dorsal.

Banghi, Ubanghi R.

A single specimen, 47 mm. long, presented by Mons. A. Baudon; it differs from young *H. stigmatogenys* in the larger eye and fewer dorsal spines.

15. *Haplochromis moeruensis*, Bouleng., 1899.

*Haplochromis moeruensis*, Bouleng. Cat. Afr. Fish. iii. p. 307, fig. 207.

Total length 95 mm.

L. Mweru.

In the eight examples in the British Museum (Natural History), including the figured type, I count 10 to 12 gill-rakers on the lower part of the anterior arch. Boulenger gives the number as 7 to 10, and it seems probable that his original material included examples of *H. stigmatogenys*.

16. *Haplochromis polyacanthus*, Bouleng., 1899.

*Tilapia stormsi*, Bouleng. Cat. Afr. Fish. iii. p. 227, fig. 149.

*Tilapia polyacanthus*, Bouleng. t. c. p. 247, fig. 165.

Total length 115 mm.

Upper Congo and L. Mweru.

In this well-marked species the nuchal and pectoral scales are very small, the lower part of the cheek is naked, and the teeth are in several series. Of the six examples I have examined three have 17 dorsal spines, two 18, and one 19.

17. *Haplochromis fuellebornii*, Hilgend. & Pappenh., 1903.

*Tilapia fuelleborni*, Bouleng. Cat. Afr. Fish. iii. p. 222.

Apparently distinguished from other East African species by having the caudal peduncle much longer than deep.

Total length 43 mm.

Lake Rukwa.

18. *Haplochromis pectoralis*, Pfeff., 1893.

*Tilapia pectoralis*, Bouleng. Cat. Afr. Fish. iii. p. 297, fig. 150.

Depth of body nearly 3 in length, length of head  $2\frac{3}{4}$ . Snout as long as diameter of eye, which is 3 in length of head, twice depth of præorbital, greater than depth of cheek; interorbital width  $4\frac{1}{2}$  in head. Jaws equal anteriorly; maxillary extending to vertical from anterior edge of eye; teeth cuspidate, in 4 series in upper jaw, 3 in lower, 40 in outer series of upper jaw. 3 series of scales on upper part of cheek, which is naked below. 8 or 9 gill-rakers on lower part of anterior arch. Pharyngeal teeth small. 30 scales in a longitudinal series, 6 from origin of dorsal to lateral line, 6 between pectoral and pelvic fins. Dorsal (XV) XVI 8 (9); last spine nearly  $\frac{2}{3}$  length of head. Anal III 8. Pectoral  $\frac{2}{3}$  length of head, reaching vent. Caudal subtruncate. Caudal peduncle as long as deep. About ten wavy dark cross-bars.

Tanganyika Territory.

One of the types, 68 mm. long.

19. *Haplochromis gigliolii*, Pfeff., 1896.*Hemichromis gigliolii*, Pfeffer, Thierw. O.-Afr. Fische, p. 24.*Paratilapia volmeringi*, Steind. Denksch. Akad. Wien, xcii. 1916, p. 80, pl. ii. fig. 3.

Depth of body 3 in length, length of head 3. Snout a little longer than diameter of eye, which is  $4\frac{1}{2}$  in length of head, equal to depth of cheek, a little less than interorbital width. Jaws equal; maxillary extending to below anterior edge of eye; teeth conical or cuspidate, in 3 (or 4) series, 40 (to 54) in outer series of upper jaw. 4 series of scales on cheek. 10 gill-rakers on lower part of anterior arch. Pharyngeal teeth small. 30 scales in a longitudinal series, 4 from origin of dorsal to lateral line, 3 between pectoral and pelvic fins. Dorsal XV (XVI 9) 10; last spine  $\frac{2}{3}$  head. Anal III (8) 9. Pectoral  $\frac{2}{3}$  head, not reaching anal. Caudal rounded. Caudal peduncle as long as deep. A dark lateral band on posterior part of body.

Tanganyika Territory.

A specimen of 73 mm. from Dar-es-Salaam. The type measures 84 mm., and that of *P. volmeringi* 103 mm.

Perhaps not distinct from *H. moffati*, but as this E. African form appears to have received two names it is maintained until further material is available for comparison.

20. *Haplochromis multicolor*, Hilgendorf, 1903.*Paratilapia multicolor*, Hilgendorf. Sitzungsab. Ges. naturf. Fr. Berlin, 1903, p. 429.*Haplochromis strigigena* (part.), Boulenger. Cat. Afr. Fish. iii. p. 299, fig. 203.

Distinguished from *H. moffati* by the broader interorbital region,  $3\frac{1}{4}$  in length of head, and from *H. wingatii* by the larger scales, 25 to 28 in a longitudinal series, 3 or 4 from origin of dorsal to lateral line, and the same number between pectoral and pelvic fins. Dorsal XIII-XV 8-10. Anal III 6-8. A continuous or interrupted lateral band.

Nile.

Numerous examples up to 70 mm. in total length, from Alexandria to Uganda.

21. *Haplochromis bloyeti*, Sauvage, 1883.*Hemichromis bloyeti*, Sauv. Bull. Soc. Philom. (7) vii. p. 159.*Ctenochromis strigigena*, Pfeff. Jahrb. Hamb. Wiss. Anst. x. 1893, p. 155, pl. ii. figs. 6-8.*Tilapia sparsidens*, Hilgendorf. Zool. Jahrb. Syst. xxii. 1903, p. 408.*Paratilapia kilossana*, Steind. Denkschr. Akad. Wien, xcii. 1916, p. 78, pl. ii. fig. 2.

Depth of body  $2\frac{3}{4}$  to 3 in the length, length of head  $2\frac{3}{4}$  to  $2\frac{1}{2}$ . Snout as long as or a little longer than diameter of eye, which is  $3\frac{1}{2}$  to 4 in length of head,  $1\frac{1}{2}$  præorbital depth, from a little less to a little greater than depth of cheek; interorbital width  $3\frac{3}{4}$  to 4 in length of head. Jaws equal anteriorly; maxillary extending to below anterior edge of eye; teeth cuspidate or conical, in 2 series, 26 to 44 in outer series of upper jaw. 3 to 5 series of scales on cheek. 7 to 9 gill-rakers on lower part of anterior arch. Pharyngeal teeth small, the 2 middle series somewhat larger, subconical in adult. 29 or 30 scales in a longitudinal series, 4 to 6 from origin of dorsal to lateral line, 5 or 6 between pectoral and pelvic fins. Dorsal XIII-XV 9-10; last spine  $\frac{1}{2}$  to more than  $\frac{2}{3}$  length of head. Anal III 8-9; third spine  $\frac{1}{2}$  to  $\frac{2}{3}$  head. Pectoral shorter than head, not reaching anal. Caudal rounded or subtruncate. Caudal peduncle as long as deep. A dark bar below eye, more distinct in males; an opercular spot; series of spots on dorsal and caudal; males with ocelli on anal.

East Africa (Tanganyika Territory).

Nine specimens, 55 to 95 mm. long, including co-types of the species, of *C. strigigena* and of *P. sparsidens*.

## 22. *Haplochromis wingatii*, Bouleng., 1902.

*Paratilapia wingatii*, Bouleng. Ann. & Mag. Nat. Hist. (7) x. p. 264.

Depth of body  $2\frac{3}{4}$  to 3 in the length, length of head  $2\frac{3}{4}$  to 3. Snout as long as or a little longer than diameter of eye, which is  $3\frac{1}{2}$  to 4 in length of head,  $1\frac{1}{2}$  præorbital depth, equal to or a little greater than depth of cheek: interorbital width 4 in length of head. Jaws equal anteriorly; maxillary extending to vertical from anterior edge of eye; teeth in 4 series in upper jaw, 3 in lower, outer conical or bicuspid, 32 to 46 in outer series of upper jaw. 3 or 4 series of scales on cheek. 8 or 9 gill-rakers on lower part of anterior arch. Pharyngeal teeth small. 30 scales in a longitudinal series, 4 to 6 from origin of dorsal to lateral line, 6 or 7 between pectoral and pelvic fins. Dorsal XIV-XV 10; last spine about  $\frac{2}{3}$  length of head. Anal III 8-10; third spine as long as last dorsal. Pectoral  $\frac{3}{4}$  to  $\frac{1}{2}$  head, not reaching anal. Caudal rounded. Caudal peduncle as long as deep. Greyish or brownish, with or without dark cross-bars and an interrupted lateral band; an opercular spot; 2 bars across snout and one below eye; pelvics blackish; one to three ocelli on anal fin.

Bahr-el-Gebel to Lake Edward.

The type, 70 mm. long, two specimens of 55 and 60 mm. from L. Albert, and one of 90 mm. from the Hima R., Mt. Ruwenzori.

23. *Haplochromis desfontainesii*, Lacep., 1802.

*Haplochromis desfontainesii* (part.), Bouleng. Cat. Afr. Fish. iii. p. 303, fig. 205.

Depth of body  $2\frac{1}{2}$  to nearly 3 in length, length of head  $2\frac{3}{4}$  to 3. Snout as long as or longer than diameter of eye, which is 4 to 5 in length of head, equal to or a little greater than præorbital depth, less than depth of cheek; interorbital width  $3\frac{1}{2}$  to 4 in head. Jaws equal anteriorly; maxillary extending to below anterior edge of eye; teeth in 2 to 4 series, cuspidate or conical, 36 to 60 in outer series of upper jaw. 3 to 5 series of scales on cheek. 8 to 10 gill-rakers on lower part of anterior arch. Middle pharyngeal teeth slightly enlarged, conical in adult. 31 to 34 scales in a longitudinal series, 6 from origin of dorsal to lateral line. Pectoral scales very small; about 8 scales between pectoral and pelvic fins. Dorsal XIV–XVI 10–11; last spine  $\frac{1}{2}$  to more than  $\frac{2}{3}$  length of head. Anal III 9–11; third spine  $\frac{2}{3}$  to  $\frac{1}{2}$  head. Pectoral  $\frac{2}{3}$  to  $\frac{1}{2}$  length of head, not reaching anal. Caudal rounded. Caudal peduncle as long as deep or a little deeper than long. An opercular spot; a bar below eye; soft dorsal and caudal spotted.

Algeria and Tunis.

Seven examples from Tunis and Biskra, 60 to 140 mm. long.

24. *Haplochromis flavii-josephi*, Lortet, 1883.

*Chromis flavii-josephi*, Lortet, Arch. Mus. Lyon, iii. p. 141, pl. viii. fig. 2.

Depth of body  $2\frac{3}{4}$  to 3 in the length, length of head  $2\frac{3}{4}$ . Snout a little longer than diameter of eye, which is 4 to  $4\frac{1}{2}$  in length of head,  $1\frac{1}{2}$  to  $1\frac{1}{2}$  præorbital depth, equal to or a little less than depth of cheek; interorbital width  $4\frac{1}{2}$  in length of head. Jaws equal anteriorly; maxillary extending to below anterior edge or anterior  $\frac{1}{4}$  of eye; teeth in 2 or 3 series, cuspidate or conical, 34 to 46 in outer series of upper jaw. 4 series of scales on cheek. 7 or 8 gill-rakers on lower part of anterior arch. Lower pharyngeals strong, united by interlocking suture; middle teeth large and blunt. 28 scales in a longitudinal series, 6 from origin of dorsal to lateral line. Scales on chest small; 5 scales between pectoral and pelvic fins. Dorsal XIV 9; last spine  $\frac{2}{3}$  length of head. Anal III 8; third spine  $\frac{1}{2}$  head. Pectoral  $\frac{2}{3}$  to  $\frac{1}{2}$

length of head, reaching vent or origin of anal. Caudal rounded. Caudal peduncle as long as deep. Two bars across snout and one below eye; an opercular spot; traces of dark cross-bars on body; an interrupted lateral band; 2 or 3 ocelli on anal fin.

Syria.

Two specimens (♂s), types of the species, 60 and 85 mm. long.

Well distinguished from the preceding by the fewer scales and by the pharyngeal dentition.

# 11. *SARGOCHROMIS*, Regan, 1920 (type *Paratilapia codringtoni*, Bouleng.).

Fourth vertebra with a pair of apophyses that unite below. Teeth in jaws conical in the adult, sometimes cuspidate in the young. Pharyngeals massive, with stout, rounded teeth. Articular surface for upper pharyngeals broad, formed by prootics, parasphenoid, and basioccipital, its basioccipital portions nearly meeting behind parasphenoid. Scales cycloid. Dorsal XIV-XV 12-15. Anal III 8-10.

## *Synopsis of the Species.*

I. 4 or 5 series of scales on cheek.

Depth of body 2 in length of fish ..... 1. *codringtoni*.

Depth of body 2½ to 2¾ in length ..... 2. *mellandi*.

II. 6 or 7 series of scales on cheek, ..... 3. *angolensis*.

## 1. *Sargochromis codringtoni*, Bouleng., 1908.

*Paratilapia codringtoni*, Bouleng. Cat. Afr. Fish. iii. p. 352, fig. 238.

? *Paratilapia marginata*, Gilchr. & Thomps. Ann. S. Afr. Mus. xi. 1918, p. 531.

Zambesi.

## 2. *Sargochromis mellandi*, Bouleng., 1913.

*Tilapia steindachneri* (part.), Bouleng. t. c. p. 209, fig. 134.

*Paratilapia mellandi*, Bouleng. t. c. p. 358, fig. 243.

L. Bangwelu; Angola.

## 3. *Sargochromis angolensis*, Steind., 1865.

*Pelmatochromis angolensis*, Bouleng. t. c. p. 408, fig. 278.

Angola.

# 12. *SERRANOCHROMIS*, Regan, 1920

(type *Chromys thumbergi*, Casteln.).

Fourth vertebra with a pair of small apophyses. Teeth



conical. Pharyngeal apophysis formed by parasphenoid in middle and basioccipital at sides. Scales cycloid or feebly denticulate. Dorsal XIV-XVIII 13-16. Anal III 8-12.

### Synopsis of the Species.

- I. 5 or 6 series of scales on cheek; præmaxillary pedicels extending to between orbits ..... 1. *macrocephalus*.  
 II. 7 to 10 series of scales on cheek.  
 Præmaxillary pedicels not reaching beyond anterior edge of orbits; head 2 to  $2\frac{1}{4}$  as long as broad .. 2. *thumbergii*.  
 Præmaxillary pedicels extending to between orbits; head  $2\frac{1}{4}$  to 3 as long as broad ..... 3. *angusticeps*.

#### 1. *Serranochromis macrocephalus*, Bouleng., 1899.

*Paratilapia macrocephala*, Bouleng. Cat. Afr. Fish. iii. p. 317, fig. 210.

*Paratilapia longimanus*, Bouleng. t. c. p. 319, fig. 212.

L. Mweru and R. Luapula; L. Ngami.

#### 2. *Serranochromis thumbergii*, Casteln., 1861.

*Paratilapia thumbergii*, Bouleng. t. c. p. 328, fig. 220.

*Paratilapia ellenbergeri*, Gilchr. & Thomps. Ann. S. Afric. Mus. xi. 1918, p. 521, fig. 141.

*Paratilapia zambesensis*, Gilchr. & Thomps. t. c. p. 522, fig. 142.

*Pelmatochromis nyamensis*, Gilchr. & Thomps. t. c. p. 539, fig. 155.

Katanga and Angola to L. Nyassa.

#### 3. *Serranochromis angusticeps*, Bouleng., 1907.

*Paratilapia angusticeps*, Bouleng. t. c. p. 321, figs. 213, 214.

L. Bangwelu; Angola; L. Ngami; Zambesi.

#### 13. *STEATOCRANUS*, Bouleng., 1899 (type *Steatocranus gibbiceps*, Bouleng.).

A single species from the Congo, apparently related to *Haplochromis polyacanthus*, but distinguished by the incisor-like teeth.

#### 14. *LAMPROLOGUS*, Schilthuis, 1891 (type *Lamprologus congolensis*, Schilth.).

This genus probably originated in Tanganyika, where the species are numerous and diversified. The three Congo species form a natural group with 5 to 7 anal spines, subacuminate caudal, second pelvic ray longest, etc. *L. obliquus*, Nichols & Griscom, 1917, is doubtfully distinct from *L. mocquardii*.

*Alphabetical numbered list of species enumerated in the present paper; the generic names in brackets abbreviated thus: A. = Anexodes, Ch. = Chalicoroides, C. = Chalicorus, Col. = Colotes, Colp. = Colpometopus, D. = Dinometopus, H. = Helcogaster, Ho. = Homœodipnits, M. = Matopus, O. = Olistherarthrus, S. = Sphinginopalpus, T. = Troglops; those marked with an asterisk are described as new.*

- |                            |                                 |
|----------------------------|---------------------------------|
| *abeillei (O.), 1.         | oneili (S.), 2.                 |
| agnatus (Col.), 9.         | *peninsularis (Ch.), 2.         |
| albilabris (S.), 8.        | *peringueyi (D.), 5.            |
| albilateris (C.), 12.      | *perrini (A.), 2.               |
| albonotatus (D.), 4.       | *petrensis (M.), 1.             |
| *atripennis (S.), 10.      | *pictifrons (Col.), 4.          |
| basicornis (Colp.), 1.     | plagiatus (Col.), 13.           |
| *bidens (S.), 1.           | *plumbeus (T.), 7.              |
| biguttatus (T.), 2.        | *raffrayi (S.), 13.             |
| *bisellatus (C.), 3.       | *rotundicollis (Col.), 14.      |
| buccator (Col.), 10.       | sellatus (Col.), 17.            |
| capensis (Col.), 18.       | *semicæruleus (T.), 8.          |
| cavifrons (D.), 1.         | *semicinctus (Ch.), 3.          |
| *chloropterus (Col.), 2.   | *subfasciatus (Col.), 16.       |
| *cicindeloides (T.), 3.    | testaceifrons (D.), 3.          |
| collaris (S.), 6.          | *tetrastigma (S.), 9.           |
| cribripennis (Col.), 3.    | *tricornutus (T.), 5.           |
| cyanopterus (Col.), 1.     | triguttatus (Ch.), 1.           |
| diversifrons (D.), 6.      | *trigonus (Col.), 7.            |
| donckieri (T.), 1.         | unifasciatus (Col.), 15.        |
| *feroculus (D.), 2.        | vinula (C.), 1.                 |
| *flavofasciatus (C.), 2.   | *vitreatus (H.), 1.             |
| *flavomarginatus (S.), 11. |                                 |
| formicarius (S.), 4.       | SYNONYMS, VARIETIES, ETC.       |
| formicoides (S.), 7.       | albicauda (D.), 1.              |
| *frontalis (Col.), 5.      | albifrons (S.), 5.              |
| innotatus (Col.), 20.      | barkeri (S.), 4.                |
| *leucostomus (Colp.), 2.   | brachypterus (D.), 1.           |
| limbatus (S.), 12.         | croceomaculatus (D.), 3.        |
| *longidens (S.), 3.        | ferox (D.), 1.                  |
| longiventris (A.), 1.      | flavonotatus (Col.), 18.        |
| *luniger (Ho.), 1.         | martini (S.), 6.                |
| myrmecodes (S.), 5.        | natalensis (D.), 1.             |
| *nasutus (Col.), 6.        | nobilis (C.), 12.               |
| *neavei (T.), 4.           | pithecus (Colp.), 1.            |
| *nodosicornis (T.), 6.     |                                 |
| *notaticornis (C.), 11.    | SPECIES NOT IDENTIFIED.         |
| notatithorax (Col.), 19.   | apicalis, Pic (S.), see p. 331. |
| oneili (Col.), 8.          |                                 |

# EXPLANATION OF THE PLATES.

♂ ♂ only figured.

## PLATE IV.

Fig. 1. *Dinometopus cavifrons*, Boh., head.

Fig. 2. " *feroculus*, sp. n., head.

Fig. 3. " *testaceifrons*, Pic, head.

- Fig. 4. *Dinometopus albenotatus*, Pic, head.  
 Fig. 5. " *peringueyi*, sp. n., head.  
 Fig. 6. " *diversifrons*, Pic, head.  
 Fig. 7. *Troglops donckieri*, Pic, head.  
 Fig. 8. " *biguttatus*, Redt., head.  
 Fig. 9. " *cicindeloides*, sp. n., head.  
 Fig. 10. " *neavei*, sp. n., head.  
 Fig. 11. " *tricornutus*, sp. n., head, in profile.  
 Fig. 12. " *nodesicornis*, sp. n., head.  
 Fig. 12a. " " antenna.  
 Fig. 13. " *plumbeus*, sp. n., head.  
 Fig. 14. " *semicervulus*, sp. n., head.  
 Figs. 15, 15a. *Chalicorus vinula*, Er., head and prothorax.  
 Fig. 15b. " " " antenna.  
 Fig. 16. " *flavofasciatus*, sp. n., head and prothorax, in profile.

## PLATE V.

- Fig. 17. *Chalicoroides* (gen. nov.) *triguttatus*, Ab., head.  
 Fig. 18. " *peninsularis*, sp. n., head.  
 Fig. 19. *Matopius* (gen. nov.) *petrensis*, sp. n., head and prothorax.  
 Fig. 19a. " " " antenna.  
 Fig. 20. *Sphingopalpus bidens*, sp. n., antenna.  
 Fig. 20a. " " " maxillary palpus.  
 Fig. 21. " *oneili*, Pic, antenna.  
 Fig. 22. " *formicarius*, Gorb., antenna.  
 Fig. 23. " *limbatus*, Pic, antenna.  
 Fig. 24. *Olistherarthrus* (gen. nov.) *abeillei*, sp. n.  
 Fig. 25. *Colotes cyanopterus*, Gorb., head, from in front.  
 Fig. 25a. " " " antenna.  
 Fig. 25b. " " " maxillary palpus.  
 Fig. 26. " *cribripennis*, Ab., head, from in front.  
 Fig. 26a. " " " antenna.  
 Fig. 26b. " " " maxillary palpus.  
 Fig. 27. " *pictifrons*, sp. n., head, from in front.  
 Fig. 28. " *frontalis*, sp. n., head.  
 Fig. 29. " *nasutus*, sp. n., head.

## PLATE VI.

- Fig. 30. *Colotes trigonus*, sp. n., head.  
 Fig. 31. " *oneili*, Pic, head.  
 Fig. 31a. " " " antenna.  
 Fig. 31b. " " " maxillary palpus.  
 Fig. 32. " *agnatus*, Ab., head.  
 Fig. 32a. " " " maxillary palpus.  
 Fig. 33. " *albilateralis*, Er. (*nobilis*, Boh.), antenna.  
 Fig. 34. " *plagiatus*, Ab., antenna.  
 Fig. 35. " *unifasciatus*, Boh., antenna.  
 Fig. 36. " *subfasciatus*, sp. n., maxillary palpus.  
 Fig. 37. " *capensis*, Pic, maxillary palpus.  
 Fig. 38. *Colpometopus basicornis*, Fairm., head.  
 Fig. 39. " *leucostomus*, sp. n., head.  
 Fig. 40. *Homodipnis luniger*, sp. n., head.  
 Fig. 40a. " " " antenna.  
 Fig. 41. *Aneurodes perrini*, sp. n., antenna.  
 Fig. 42. *Helcogaster vitreatus*, sp. n., antenna.

XLII.—*South African Species of the Genus Hypolithus, Dejean.* By C. N. BARKER, F.E.S. (of the Durban Museum).

OF all the Carabidæ the Harpalini are perhaps the most difficult, and the species of the genus *Harpalus*, on account of their numbers, their similarity of facies, and the wholly insufficient descriptions of those that have been published, are quite impossible of satisfactory treatment by anyone who has not access to the scattered types for comparison.

The genus *Hypolithus*, however, although it includes a fair number of species, and doubtless there are many more yet to be found, has a less extended range, being principally confined to the eastern side of our subcontinent, and on that account they are better known to me. Of the considerable number described by Dr. Péringuey, most of them were collected by my friends the Rev. J. A. O'Neil and Dr. G. A. K. Marshall, and some by myself; co- or paratypes of all these are contained in the Durban Museum collection.

There is a good deal of sexual variation among some of the species, and it is therefore unfortunate that authors have omitted to state whether both sexes or which sex is represented in their descriptions.

In addition to eight new species described by me below, there are individual examples of others that I have little doubt will later prove to be good species, but the characteristics of which are not sufficiently distinctive to be treated on such limited material. I have appended, however, some remarks on these beneath the headings of their nearest allies, which may prove useful for later reference. All types of species described by me are in the Durban Museum collection. The table given below I trust may prove of some use as a guide to the recognition of the species of this genus. It is compiled principally on the general facies of the insects, which, however, thus appear to group themselves on fairly natural lines. The transitions of one type into another is usually so gradual—in some cases almost imperceptible—that it is extremely difficult to find definitions for sections which satisfactorily express their distinctive characteristics, and with the best will I do not pretend to have succeeded otherwise than indifferently in my attempt.

*Table of South African Species.*

(Those marked with asterisk known to me by description only.)

- 1 (18). Pubescent in both sexes.
- 2 (9). Head and prothorax finely and densely punctate, the latter approximately of equal width at base and apex and ampliate medially.
- 3 (4). Length  $15\frac{1}{4}$ – $16\frac{1}{4}$  mm.; width  $6\frac{1}{4}$ – $6\frac{1}{2}$  mm. Broad, black, subopaque; elytra narrowly striate, finely shagreened, pubescence dense, yellow. Antennæ piceous, terminal joints reddish and two first flavous; legs: femora flavous, knees, tibiae, and tarsi darker. *H. tomentosus*, Boh.
- 4 (3). Length  $14$ – $14\frac{1}{2}$  mm.; width  $5\frac{1}{4}$ – $6$  mm. Identical in shape and sculpture or latter a trifle coarser. Antennal joints and legs below knees darker, tibiae and tarsi of posterior legs wholly black. *H. tetricus*, Pér.?
- 5 (3). Length  $15$ – $16$  mm.; width  $5$ – $5\frac{3}{4}$  mm. Narrower, less opaque; prothorax more attenuated at base and apex; usually with narrow ferruginous margins; antennæ and legs unicolorous. *H. porrectus*, Pér.
- 6 (3). Length  $13$  mm.; width  $5$  mm. Prothorax less plane, hind angles sharp, with no sinuation above the angles. Antennæ and palpi testaceous red, last joints of latter tipped with flavous. Legs black, except deep red coxae and tarsi. Elytra obscurely iridescent, striæ deep, finely punctate, intervals convex, very faint seriate punctures on alternate intervals. *H. mozambicus*, sp. n.
- 7 (6). Length  $9\frac{1}{2}$ – $12$  mm.; width  $3\frac{1}{2}$ – $4\frac{1}{2}$  mm. Black, very briefly and densely pubescent. Prothorax flatter, sides very little contracted to base, which is wider than apex; elytra subparallel, not much wider than base of prothorax†. Antennæ, palpi, margins of prothorax, and legs flavescens. Seriate punctures on alternate intervals faint, sometimes absent. Widely ranged with considerable local variations. *H. holosericeus*, Dej.?
- 8 (7). Length  $9\frac{1}{2}$ – $10$  mm.; width  $3\frac{1}{2}$ – $3\frac{3}{4}$  mm. Shape similar. Head black; elytra also black, with margins and macules

† A well-defined race of this species from Salisbury, S. Rhodesia, has the prothorax more contracted to base and the elytra less parallel, more oblong-ovate.

on alternate intervals of dorsum flavescens; beneath piceous; antennæ, palpi, legs, and prothorax flavescens, the latter with an infusate patch on the middle basal area . . . . .

*H. eschiri*, Dej.

- 9 (8). Length 12-13 mm., width 5 mm. Colour and pattern similar, infusate parts of elytra iridescent (*vide* Trans. S. Afr. Phil. Soc. vol. viii. p. 432) . . . . . \**H. saponarius*, Oliv.

- 10 (15). Head and prothorax more remotely punctate, the latter short, widest above middle, more or less sinuately attenuated to base.

- 11 (12). Length 7-8 mm.; width  $2\frac{3}{4}$ - $3\frac{1}{4}$  mm. Testaceous yellow; head, prothorax, and beneath darker, more reddish; two longitudinal vittæ (sometimes absent) on thorax, and a broad scutellar band from base, but not reaching apex, teneous black. Prothorax not much sinuately contracted to base, which is about as wide as apex.

*H. audens*, Pér.

- 12 (11). Description (*vide* Annals S. Afr. Mus. vol. v. p. 277) agrees with that of "*audens*," except that the abdomen is stated to be black. A very doubtful species . . . . .

*H. cruentulus*, Pér.

- 13 (14). Length 9 mm.; width  $3\frac{1}{4}$  mm. Black; elytra metallic blue-black; antennæ, palpi, prothoracic margins, and legs reddish testaceous. Head and prothorax moderately closely punctate. Obsolete seriate punctures on intervals 3 and 5 of elytra. Both sexes.

*H. punctulatus*, Boh.

- 14 (13). Length  $8\frac{1}{4}$  mm.; width  $2\frac{3}{4}$  mm. Similarly coloured, much narrower and more depressed; prothorax more attenuated to base, subcordiform. Punctuation of head and prothorax deeper and more remote. Seriate punctures on intervals 3, 5, and sometimes on 7. Females only . . . . .

*H. tenuissimus*, sp. n.

15. Length  $7\frac{1}{4}$  mm.; width 3 mm. Pale testaceous brown. Legs, antennæ, and palpi flavescens; head and prothorax metallic-glossed; elytra, except narrow margins and some tessellated spots of ground-colour, deep brown. Prothorax very short, subcordiform, hind angles acute. Punctuation of head and prothorax fine, dense. The proper place for this species is very doubtful, and no near allies are known to me. Two females only . . . . .

*H. strenuus*, Pér.

- 16 (25). Prothorax not or a little wider at base than at apex. Head and prothorax,

- except the basal depressions, smooth or very faintly aciculate; more or less brightly iridescent species.
- 17 (18). Length  $9\frac{1}{2}$  mm.; width 3 mm. Black. Antennæ and palpi testaceous red, legs deep red, and the tibiæ piceous or darker red. Elytra parallel, striæ deep, intervals convex and densely aciculate-punctate; spaced punctures on intervals 3, 5, and 7. Two males only ..... *H. optivus*, Pér.
- 18 (17). Length  $7-7\frac{1}{2}$  mm.; width  $2\frac{1}{2}-3$  mm. Prothorax shorter, elytra less parallel. Legs, palpi, and antennæ flavescent, joints of latter lineally maculated with black or nearly wholly infuscated. Elytral intervals less convex, shagreening finer, spaced punctures absent or obsoletely present on intervals 3 and 5. Several of both sexes. *H. imitativus*, Pér.
- 19 (22). Females pubescent, males glabrous.
- 20 (21). Length 9-10 mm.; width  $3-3\frac{1}{2}$  mm. Black, brightly iridescent; antennæ, palpi, margins of prothorax, and legs flavescent to reddish testaceous. Prothorax gently rounded, little (one-quarter) wider than long, margins widely reflexed, hind angles rounded, striæ deep, intervals a little convex, finely shagreened, seriate punctures on intervals 3 and 5, rarely faintly on 7. All males ..... *H. glaber*, Boh.
- 21 (20). Length  $9-10\frac{1}{2}$  mm., width  $3\frac{1}{2}-4$  mm. Identical with above in every respect, except that the elytra are briefly pubescent and the intervals between striæ plane. All females ..... [of *glaber*, probably.
- 22 (20-21). Length  $9\frac{1}{2}-10\frac{1}{2}$  mm.; width  $3\frac{1}{2}-3\frac{3}{4}$  mm. Coloration identical. Differentiation of sexes similar to that of "*caffer*" cum "*glaber*." Prothorax similarly shaped, but more transverse and more convex at apex; elytral striæ finer, aciculation of intervals as fine but less dense, and quite plane in both sexes. Seriate punctures on third, fifth, and seventh ..... *H. caffer*, Boh., female
- 23 (41). Glabrous in both sexes. *H. legitimus*, sp. n.
- 24 (22). Length  $8\frac{1}{2}-9\frac{1}{2}$  mm.; width  $3-3\frac{1}{2}$  mm. Antennal joints above 3rd more or less infuscated; prothorax shorter, sides very gently and evenly rounded, and less narrowed to base, hind angles sharp. Seriate punctures on intervals 3 only. .... *H. rivalis*, Pér.
- 25 (24). Length  $8\frac{1}{2}-9$  mm., width  $3-3\frac{1}{2}$  mm. Coloration the same, but elytra (♂)

obscurely, (♀) sometimes hardly perceptibly, iridescent. Prothorax more elongate, front angles more declivous, sides more briefly amplified and straighter to hind angles, which are obtusely right; margins of elytra more widely reflexed, puncturation less fine; seriate punctures conspicuous on intervals 3 and 5, rarely obscurely on 7 . . . . .

[= *ovampoanus*, Pér.  
*H. interstitialis*, Boh.,

- 26 (33). Prothorax more distinctly wider at base than at apex; broader-sided species.

- 27 (25). Length  $7\frac{1}{2}$ – $8\frac{1}{2}$  mm.; width 3– $3\frac{1}{2}$  mm. Deep brownish-red head and dorsal parts of elytra darker, iridescent; legs, antennæ, and palpi testaceous yellow. Prothorax a little more transverse, similarly shaped, disc densely aciculate-punctate, lateral depressions and base more so. Elytra short, tapering to apex. Seriate punctures on intervals 3 and 5 . . . .

*H. patruelis*, Pér.

- 28 (27). Length 10 mm.; width  $3\frac{1}{2}$  mm. Black, very shiny; legs, antennæ, and palpi deep testaceous red. Head and anterior part of prothorax smooth, the latter a little convex, broad ( $3\frac{1}{2}$  by  $2\frac{1}{2}$ ), margins above the rounded hind angles broadly reflexed and impressed within. Puncturation of elytral intervals fine with distinct remote punctures on 3, 5, and 7. One female only . . . . .

*H. connexus*, Pér.

- 29 (28). Length  $8\frac{1}{2}$  mm.; width  $3\frac{1}{2}$  mm. Piceous above, brightly glossed with metallic green; antennæ, mouth-parts, and legs pale testaceous yellow. Prothorax shaped like that of *interstitialis*, but broader and with posterior angles sharp, disc aciculate and nearly plane. Elytra short, parallel-sided, seriate punctures on intervals 3, 5, and 7, very distinct. One male only.

*H. marshalli*, sp. n.

- 30 (33). Prothorax plane above, gently, obliquely ampliate from below front angles, and hardly narrowed to base; elytra elliptic in shape.

- 31 (20). Length 11– $11\frac{1}{2}$  mm.; width 4 mm. Black, very little shiny. Antennæ, palpi, and legs reddish testaceous. Head and prothorax densely aciculate punctate, the latter very transverse ( $3\frac{1}{2}$  by  $2\frac{1}{2}$ ), lateral basal impressions broad and shallow, hind angles briefly rounded. Elytra more elongate, tapering to apex; intervals plane, their puncturation fine and seriate,



- punctures on third and fifth only.  
One of each sex. .... *H. differens*, sp. n.
- 32 (31). Length 11 mm.; width 4 mm. Black with a greenish iridescent tinge to elytra; legs and two first joints of antennæ flavous, the remainder of latter ferruginous. Juxta-sutural intervals of elytra convex and subcarinate. No seriate punctures on intervals (*vide* description, Trans. S. Afr. Phil. Soc. vol. vii. p. 435) .... \**H. integer*, Pér.
- 33 (31). Length  $7\frac{1}{2}$ – $7\frac{3}{4}$  mm.; width 3 mm. Black, very shiny, faintly iridescent; legs, antennæ, mouth-parts, and margins of prothorax testaceous yellow. Prothorax: shape similar, more declivous at front angles, anteriorly faintly aciculate, lateral basal impressions densely punctulate. Shape of elytra similar, striæ fine, intervals broad and plane. .... *H. dubius*, sp. n.
- 34 (38). Prothorax more abruptly amplified below front angles, obliquely and very slightly narrowed to base; base and apex about equal in width; elytra parallel-sided.
- 35 (36). Length  $6\frac{1}{2}$ – $6\frac{3}{4}$  mm.; width  $2\frac{1}{2}$ – $2\frac{3}{4}$  mm. Dark red-brown; legs, antennæ, mouth-parts, and margin pale testaceous yellow. Prothorax very transverse, more than  $\frac{1}{2}$  wider than long; elytra more slender and depressed; aciculation and puncturation of prothorax and elytra coarser; spaced punctures on third, fifth, and seventh intervals. Many of both sexes .... *H. castaneus*, sp. n.
- 36 (35). Length  $6\frac{1}{2}$ – $7\frac{1}{4}$  mm.; width  $2\frac{1}{2}$ –3 mm. Black, with prothorax and head piceous, the former suffusedly testaceous-margined. Legs testaceous yellow, antennæ a shade deeper. Elytra more or less iridescent. Prothorax similar, a trifle wider, aciculation and puncturation finer. Elytra elongate, as broad as base of prothorax, striation and puncturation less coarse; seriate punctures similarly placed. Many of both sexes . . . *H. propinquus*, sp. n.
- 37 (36). Length  $6\frac{3}{4}$  mm.; width  $2\frac{1}{2}$  mm. Black, elytra iridescent; margins of prothorax, elytra, and suture of latter for a short distance above apex yellowish to reddish testaceous. Prothorax as in "*castaneus*" a little less wide. Sculpture a little finer, seriate punctures similarly disposed. One male and one female . . . . . *H. turbatus*, Pér. ?

38. Length  $6\frac{1}{2}$  mm.; width 3 mm. Black, shiny, smooth; beneath obscurely ferruginous; antennæ, palpi, and legs testaceous yellow; prothorax wide, margined with testaceous, etc. (*vide* p. 201, *Insecta Caffraria*, Boheman). Dimensions as given above differentiates it from any *Hypolithus* known to me, otherwise hardly separable from *propinquus* ..... \**H. melancholicus*, Boh.
- 39 (41). Head relatively smaller, less retracted within thorax, oblong-ovate, convex species.
- 40 (41). Length 7 mm.; width 3 mm. Black, very iridescent, rarely not so; legs testaceous yellow, tibiae and tarsi a shade darker; antennæ flavous with all joints, except two first, lineated above with fuscous. Spaced punctures faintly defined on third interval or absent ..... *H. difficilis*, Pér.
- 41 (40). Length  $7-7\frac{1}{2}$  mm.; width  $2\frac{1}{2}-3$  mm. A trifle less ovate; prothorax similar, but with posterior angles acute instead of rounded. Dark metallic green, iridescent; elytra with a short posterior sutural and lateral yellow band ..... *H. scitus*, Pér.
- 42 (41). Length 12 mm.; width  $4\frac{1}{2}$  mm. Description, *vide* Trans. S. Afr. Phil. Soc. vol. viii. p. 437. Markings and coloration appear to be like those of "*scitus*," but it is a much larger insect. Quite unknown to me .... \**H. ornatus*, Pér.

*Hypolithus holosericeus*, Dej., and *H. marginicollis*, Boh.

Péringuey (Trans. S.A. Phil. Soc. vol. vii. p. 434) states that he cannot differentiate the former from the latter, though he admits that "*Holosericeus*" is a little larger. He gives the following as the dimensions of his "*holosericeus*":—Length 11–13 mm., width  $4\frac{1}{2}-5$  mm. Boheman for his "*marginicollis*" gives  $12 \times 5$  mm. The species determined for me by Dr. Péringuey many years ago as *H. holosericeus*, Dej., is a much smaller insect than the above, ten examples, including both sexes, range from  $9\frac{1}{2}-11$  mm. long by  $3\frac{3}{4}-4\frac{1}{4}$  mm. wide, and only one female example attains the maximum of 11 mm.

As I am not in a position to compare this race with Dejean's "*holosericeus*" and Boheman's "*marginicollis*," I am giving below a description of it, which in addition to its deficiency in size shows some further minor differences.

*Hypolithus holosericeus*, Dej. ?

Above piceous, obscurely iridescent, densely clothed with very short, pale yellowish pubescence. Head black, shiny; antennæ, palpi, and labrum reddish yellow, the latter more or less infusate basally. Legs flavescent. Prothorax: margins laterally, usually at apex and base medially, and the epipleuræ red. Beneath piceous to piceous red.

*Head* hardly convex, short, transverse, densely and very finely punctate, frontal impressions, on either side, slight and transverse groove narrow.

*Prothorax* very broad ( $3\frac{1}{2}$  by  $2\frac{1}{2}$  mm.), wider at base than at apex, the former truncate, shallowly emarginate medially, the latter broadly emarginate, its angles rounded, moderately declivous; sides gently amplified to middle, very little contracted to the sharply-rounded hind angles; disc hardly convex, finely, densely, and evenly punctate, median groove very short, reaching neither apex nor base, lateral basal impressions broad, shallow.

*Elytra* hardly wider at base than base of prothorax, very little widened immediately below shoulders, sides straight to beyond middle, gently rounded to and sinuate before apex, hardly convex above, shortly pubescent and obscurely iridescent, moderately deeply striate, intervals plane, finely shagreened, third, fifth, and seventh with obsolete spaced punctures, but sometimes wanting.

*Beneath* smooth, shiny, impunctate.

*Hab.* Natal Coast districts. A common species.

A well-marked race of the above occurs at Salisbury, S. Rhodesia, the size of which averages a trifle more ( $10-11\frac{1}{2}$  by  $3\frac{1}{2}-4\frac{1}{2}$  mm.). It differs as follows:—puncturation of head and prothorax a little coarser and less dense, the latter less transverse, the sides more contracted to base, which is therefore considerably less wide than the elytra at base; the elytra (especially in the females) are elongate-ovate, instead of parallel as in both sexes of the Natal race, and the puncturation of the elytral intervals is less fine and the pubescence a little sparser.

*Hab.* Salisbury, S. Rhodesia. Collected by the Rev. J. A. O'Neil.

Since writing the above, I have received from Delagoa Bay a female example, which in size (12 mm. long by  $4\frac{1}{2}$  mm. wide) agrees almost exactly with Boheman's dimensions for his "*marginicollis*." It is proportionately as transverse as the Natal coastal race, but the puncturation of the head and prothorax is coarser, like that of the South Rhodesian race.

It differs from both these races in having the knees, tibiae, and tarsi, and all the joints of antennæ, on the upper sides, excepting the two first, darkened or browned. The femora and first two joints of antennæ are pale flavescent. These slight differences of coloration are analogous to what occurs between *H. tomentosus*, Boh., and *tetricus*, Pér., referred to below.

*Hypolithus tomentosus*, Boh., race *tetricus*, Pér.

Three examples of "*tetricus*" (one male and two females) from the place of their origin, Salisbury, S. Rhodesia, agree exactly with the author's description, except in size, which ranges from  $1\frac{1}{2}$  by  $5\frac{1}{2}$  in the male to  $1\frac{1}{2}$  by 6 mm. in the females. The dimensions given by Péringuey are  $12\frac{1}{2}$  by  $5\frac{1}{2}$  mm. *H. tomentosus*, Boh., varies considerably individually in the depth of coloration of the antennæ and the tibiae and tarsi of the legs. The tibiae and tarsi are always a shade darker than the femora, and the inner edges of the former and the whole of the latter of the intermediate and posterior legs are always more or less infuscated. In "*tetricus*" the same rule applies, but in a more extreme degree; the knees, tibiae, and tarsi of the posterior (sometimes also of the intermediates) being wholly black, those of the other pairs being more or less infuscated with black.

The difference in puncturation and pubescence is of the slightest, and the shapes are identical.

There is nothing that I can conceive that justifies the acceptance of "*tetricus*" other than a geographical form or race of Boheman's *tomentosus*.

*Hypolithus mozambicus*, sp. n.

Length 13 mm.; width 5 mm.

Black, with very short pale pubescence and obscurely iridescent. Antennæ and palpi ferruginous, the terminal joints of the latter tipped with flavous. Legs black, except coxæ and tarsi, which are piceous red.

*Head* transverse, shiny, aciculate-punctate, frontal foveæ on either side deep, transverse line fine.

*Prothorax* transverse ( $4\frac{1}{2}$  by 3 mm.), base wider than apex, the former in the middle shallowly, the latter broadly emarginate, frontal angles roundly produced, moderately declivous, sides gently ampliate to middle, thence very little inwardly inclined to posterior angles, which are bluntly right, disc a little convex, finely subconfluently punctate, median line short interrupted above by well-defined arcuate

transverse groove, lateral basal depressions broad, shallow, reaching base.

*Elytra*: width at base about equal to base of prothorax, truncate, very little amplified below shoulders, sides nearly straight and parallel to beyond middle, thence gently rounded to and a little sinuate before apex, the margins broadly and deeply reflexed, above punctate-striate, intervals convex, subcostate above apical declivity, very minutely shagreened, small seriate punctures on the third, fifth, and seventh, numerous and more closely set posteriorly, space within reflexed border very roughly sculptured towards apex.

*Underside* very shiny and iridescent, pectus and abdomen aciculate, metepisterna and pleuræ coarsely remotely punctate.

A very distinct species with no very near ally known to me. The shape of the prothorax is similar to that of "*tomentosus*," but is less plane above, and there is hardly a trace of sinuation above the hind angles, which are also sharper. The punctate striae, the subcostate intervals, the closely-spaced punctures above the posterior declivity, and the deeply-reflexed margins are all very distinctive features of this species.

*Hab.* Inhambane, Portuguese E. Africa. Collected by A. Bodong. Described from a single female example.

*Hypolithus tenuissimus*, sp. n.

Length  $8\frac{1}{4}$  mm. ; width  $2\frac{3}{4}$  mm.

Black above, deep red to piceous beneath, pubescent. Legs, antennæ, palpi, and margins (narrowly) of prothorax flavescent. Elytra with a metallic-blue sheen in certain lights ; the suture for some distance above apex, the lateral margins, and the pygidium testaceous red. Base of the mandibles, epistome, and labrum red to piceous red.

*Head and prothorax* coarsely, a little remotely punctate, sparsely covered with a rather long yellowish pubescence ; neck smooth, glabrous.

*Prothorax* truncate at apex, frontal angles much depressed, sides amply rounded for about one-third their length, thence obliquely and straightly drawn in to base, which is about one-fourth less wide than the apex, posterior angles rounded, median groove broad and deep, lateral depressions shallow, a little more densely punctate than rest of the surface.

*Elytra* at base truncate, about one-third wider than base of prothorax ; shoulders squarely rounded, sides elongate,

parallel, briefly rounded to and a little sinuate before apex, depressed above, covered with a longish yellow pubescence, striae well defined but not deep, intervals plane, densely and finely punctulate, seriate punctures faintly indicated on third, fifth, and sometimes on seventh intervals.

*Underside* subopaque, more or less aciculate-punctate, abdomen very sparsely pubescent.

Nearly allied to *H. punctulatus*, Boh., but more depressed and much more slender. The prothorax more contracted to base.

*Hab.* Salisbury, S. Rhodesia. Three females received from the Rev. J. A. O'Neil. Male at present unknown to me.

I have a single example (female) of a distinct species, near to *puncticollis*, Boh., and *tenuissimus*, mihi, from Salisbury, S. Rhodesia, Rev. J. A. O'Neil. In contour it is nearest to the former, though smaller ( $7\frac{1}{2}$  by  $3\frac{1}{2}$  mm.) and a little more ovate. The puncturation of prothorax is closer and nearly as coarse as that of "*tenuissimus*." The colour is deep chestnut (elytra darkest), with an æneous sheen and covered with a yellowish pubescence.

*Hypolithus audens*, Pér., and *H. cruentulus*, Pér.

The description of *H. cruentulus*, Pér. (*vide* Ann. S. Afr. Mus. vol. v. p. 277), from Salisbury, S. Rhodesia, agrees fairly well with the same author's description of *H. audens*, Pér. (*vide* Trans. S. Afr. Phil. Soc. vol. ix. p. 348), collected by me on the Natal Coast, and I have every reason to believe they are one and the same species. I have received from Salisbury many specimens of what undoubtedly are *H. audens*, Pér., which do not even show any local variation from those taken in Natal.

Dr. Péringuey describes the pectus of "*audens*" as piceous and the underside of "*cruentulus*" as black. Neither of these descriptions is quite correct for the specimens, be they from Natal or Rhodesia, that have passed through my hands. Some are darker than others, but all may be described as dull reddish beneath, more or less clouded with fuscous between the abdominal segments. With the exception of one from Natal and two from Rhodesia, all my specimens have on either side of the middle line of the prothorax a longitudinal infuscated vitta and in one very dark specimen these bands are sufficiently widened to nearly coalesce, and the dorsal area of the elytra has a distinct greenish æneous sheen.

*Hypolithus caffer*, Boh., and *H. glaber*, Boh.

I owe it to the suggestion of Mr. H. E. Andrewes, a well-known authority on Oriental Carabidæ, my present conviction that *H. caffer*, Boh., and *H. glaber*, Boh., are the sexes of one and the same species, the former being the female of the latter. Both of these have a wide South African range, and, to the best of my knowledge, in those places where the one occurs the other is also found, and only males of "*glaber*" and females of "*caffer*" are on record.

In shape and sculpture they are alike, except in those slight details which are usual between the sexes; but the elytra of "*caffer*" are pubescent, those of "*glaber*," as its name implies, are not so, and this naturally gives them a different appearance. There are, however, in fresh specimens of "*glaber*" some sparsely distributed hairs about the posterior margins.

A very nearly allied species, which I am describing below under the name "*legitimus*," sp. n., shows identically similar sexual differentiation.

*Hypolithus legitimus*, sp. n.

Length  $9\frac{1}{4}$ – $10\frac{1}{2}$  mm.; width  $3\frac{1}{4}$ – $3\frac{1}{2}$  mm.

Black; elytra very iridescent; piceous to piceous red beneath. Legs, antennæ, and palpi testaceous yellow; labrum and margins—narrowly—of prothorax, and the epipleuræ of elytra deep red; elytra of males (except for a little sparse pubescence about the posterior margins) glabrous, of the females briefly pubescent\*.

*Head* smooth, glabrous, very convex in the posterior part, frontal foveæ inconspicuous.

*Prothorax* transverse ( $\sigma$   $2\frac{1}{2} \times 2$ ), anterior part smooth or obsolescently aciculate, shallow basal depressions densely aciculate-punctate, front shallowly bisinuate with the median part convex, angles obtusely prominent, sides amplified, widest about middle, nearly evenly rounded from apex to the rounded posterior angles; base a little wider than apex, median line short, intercepted above by the usual transverse arcuate sulcation, the space between it and the front margin distinctly raised to meet a corresponding convexity of base of head.

\* One female in my possession is as devoid of pubescence as the average male.

*Elytra* very little wider at base than base of prothorax, briefly amplified below shoulder, thence nearly straight to beyond middle and gently rounded to apex, striæ very fine, hardly deeper in male than in female, intervals quite plane, very iridescent, minutely and densely aciculate-punctate; conspicuous spaced punctures on third, fifth, and seventh intervals.

Very nearly allied to "*H. caffer*" cum "*glaber*," Boh, but differentiated as follows:—

*Prothorax* nearly similar in outline, but more transverse and less contracted to base; posterior part of head and the central frontal part of prothorax conspicuously more convex, and the front angles of the latter more prominent. *Elytra* relatively shorter, striæ less deep, especially noticeable as between males. Seriate punctures as conspicuous on seventh as on the other intervals.

Description taken from two males and three females.

*Hab.* Malvern, Natal, collected by the author. Up to now, I have taken it at or received it from this locality only. *H. glaber* cum *caffer* also occurs at Malvern as in other places.

### *Hypolithus rivalis*, Pér.

The co-type (male) of this species (*vide* Ann. S. Afr. Mus. vol. v. p. 279) belonging to the Durban Museum Collection is before me, and I find that in some minor details it differs from the author's description. Referring to the remote punctures, so often present on some of the elytral intervals, the description says "*interstitiis tertiis quintoque punctis majoribus seriatis nullis*." The co-type has shallow but distinct punctures on the third intervals. No mention is made of the extreme fineness of the striation and puncturation of the elytra, which is even finer than that of *legitimus*, *mihi*, and *glaber*, Boh., and in the brightness of the iridescence it is only equalled by the males of these two species.

To this species I have tentatively assigned two female specimens collected by me on the Pungwe River, Mozambique, which agree exactly with the male co-type in shape of the prothorax, which in this species is very short and broad (a full 8 mm. wide by  $2\frac{1}{2}$  mm. long), and they also have the hind angles subacute; further the seriate punctures of the elytra are limited to the third intervals only. They are, however, a little smaller and less parallel-sided, and the striation and puncturation are a trifle deeper and coarser.



Two further specimens, a male from Nkusi River, Zululand, and a female taken at light, Durban, appear to be the sexes of another distinct species, which have the prothoraces shaped exactly as in "*rivalis*." The dimensions of the male are 10 mm. by  $3\frac{1}{2}$  mm. and of the female 9 mm. by  $3\frac{1}{2}$  mm. The head is, however, more massive, with more conspicuous frontal foveæ and transverse sutures. The sides of the elytra, especially in the male example, are less parallel and taper more to apices, as in "*connexus*" and other species that follow. The seriate punctures are limited to the third intervals as in *rivalis*, but the striation and puncturation are deeper and coarser. Their coloration is black, faintly iridescent in the female, but not in the male example. Antennæ, palpi, and legs are lighter testaceous yellow, especially the femora of the latter, which are pallid. It is, however, I think, inadvisable to name and describe these on such limited material and coming as they do from different localities.

*Hypolithus imitativus*, Pér.

*H. imitativus*, Pér., appears to be a fairly common species in the neighbourhood of Salisbury, S. Rhodesia, the only place I have so far received it from. Specimens vary a good deal in size, and the pubescence, which in fresh specimens is dense, is often so much rubbed off as to be only perceptible in a few isolated spots about or near the margins. The antennæ also vary much in the amount of infuscation. Some examples only show inconspicuous linear macules, whilst others have their joints beyond the three first almost wholly infuscate. In the specimens before me (two males and three females), the males are a trifle larger and have the antennæ only finely lined with black; the females have these joints wholly infuscate, except at the intersection of the joints. Whether this may be a sexual distinction or simply accidental we must await the result of examination of larger series to determine. Seriate punctures on the intervals of the elytra are absent in all but one male example, in which they are faintly indicated on the third and fifth.

*Hypolithus interstitialis*, Boh., and *H. ovampoanus*, Pér.

Two specimens received from Mr. (now Dr.) G. A. K. Marshall as paratypes of *H. ovampoensis* (= *ovampoanus*, Pér., *vide* p. 348, vol. ix. Trans. S. Afr. Phil. Soc. 1898), at about the same time the description was published, are

inseparable from specimens of *H. interstitialis*, Boh., as interpreted by me. *Interstitialis*, Boh., is about the commonest *Hypolithus* we have in or about Durban, and these specimens do not differ in the slightest from those received from Salisbury as *ovampoensis*, Pér.\* Boheman in his description of *interstitialis* does not mention any iridescence being present, but this is a very variable factor in many species, and in this one it is never very conspicuous, though usually present.

Péringuey compares his *ovampoanus* with his *patruelis* thus: "sides of prothorax not so parallel . . . there is no trace of punctures on seventh interval in *patruelis*."

The two specimens before me labelled *ovampoensis* have prothoraces exactly similarly shaped to those of *patruelis*, and the seriate punctures on the seventh intervals are also wanting. However, in some examples of *interstitialis* = *ovampoanus* these punctures are present. The incidence of these punctures (although helpful) is not very reliable, as variations in this respect are shown in individuals of several species of this genus.

*Hypolithus marshalli*, sp. n.

Length  $8\frac{1}{2}$  mm.; width  $3\frac{1}{2}$  mm.

Piceous red, brilliantly glossed with metallic green on the upperside. Antennæ, palpi, and legs testaceous yellow; labrum, margin of epistome, mandibles, and reflexed border of prothorax reddish testaceous.

*Head and prothorax* very shiny, the former densely faintly aciculate, frontal foveæ and transverse suture shallowly defined. Anterior part of prothorax densely aciculate, base and sides very densely and finely punctate, median groove deep, not quite reaching apex or base, basal depressions shallow and inconspicuous, apex narrowly raised in the middle, a little sinuate on either side and with front angles very broadly rounded; sides gently ampliate to about middle, thence, except for a very slight sinuation immediately above, straight to posterior angles, which are sharply right; base a little wider than apex, truncate, very slightly emarginate medially.

*Elytra* short, base of equal width with that of prothorax, truncate, angles sharp, hardly widening below; sides parallel to posterior declivity, rounded to and sinuate before apices,

\* Sic, as received by me, but published "*ovampoanus*."

which are subacute; depressed above, moderately deeply striate, intervals, except about posterior declivity, plane and densely punctulate; very distinct seriate punctures on intervals 3, 5, and 7, and the space between eighth stria and reflexed border coarsely sculptured.

*Underside* very deep red, shading to red about middle of abdomen and metasterna, glabrous and smooth, except for some remote punctures on meso- and metasternal parts.

The shape of the prothorax is not unlike that of *H. connexus*, Pér.; it is equally transverse, the front angles are a little more depressed and the hind angles sharp instead of rounded.

The metallic-green lustre is present on head and prothorax, as well as on the elytra, which differentiates it from other species in which an evanescent iridescence is present on the elytra only. Being so distinct a species, I have ventured to describe it from a single male example.

*Hab.* Marandella, Rhodesia (*G. A. K. Marshall*, 1897).

*Hypolithus differens*, sp. n.

Length  $11\frac{1}{2}$  mm.; width  $4\frac{1}{4}$  mm.

Black, moderately shiny above, dark red to piceous beneath; legs, antennæ, palpi, labrum (centre infuscate), and prothoracic margins (narrowly) reddish testaceous.

*Head* finely, densely aciculate-punctate, shiny, frontal depressions shallow, transverse suture fine.

*Prothorax* very transverse ( $3\frac{3}{4}$  by  $2\frac{1}{4}$  mm.), front bisinuate, angles produced, briefly rounded, sides very gently ampliate to middle, thence straight and hardly narrowed to posterior angles, which are obtusely right; base much wider than apex, very shallowly emarginate in the middle, disc nearly plane, moderately declivous frontally, densely, finely punctulate, median line short, sides above and base broadly shallowly impressed, densely rugosely punctate; reflexed margins narrow.

*Elytra* of nearly equal width with prothorax at bases, shoulders subquadrate, briefly rounded, very briefly amplified below, thence a little obliquely inclined to beyond middle and gradually rounded to and slightly sinuose before apex; hardly convex above, striæ fine, intervals broad and quite plane, moderately densely but not confluent punctulate, numbers three and five with distinct seriate punctures.

Judging by description (*vide* Trans. Phil. Soc. vol. vii. p. 435), it is very nearly related to *H. integer*, Pér. The following are points upon which they appear to differ:—

*H. integer.*

Black, with faint greenish iridescence.

Two basal joints of antennæ flavous, remaining joints ferruginous.

Three juxta-sutural intervals of elytra slightly convex and very slightly carinate. No seriate punctures.

*H. differens.*

Black, no iridescence, margins of prothorax testaceous red.

Unicolorous testaceous red.

All intervals wide and quite plain in both sexes. Seriate punctures on intervals 3 and 5.

These differences taken apart are not of much importance, but together, I think, justify the acceptance of "*differens*" as a species distinct from "*integer*." Description from two examples, male and female.

*Hab.* Field's Hill, Natal; Durban.

I have two species allied to "*differens*," mihi, which, judging by individual examples in my possession, show the same broad depressed facies as "*differens*," but are undoubtedly distinct from it and from one another. This section of the genus has, probably, many closely allied forms yet to be described, which will require careful examination and comparison of the sexes to justify their publication as new species.

The first of those referred to above is a female taken at light in Durban. It is 10 mm. long by barely 4 mm. wide. Compared with the female of *differens*, the prothorax is a little less arcuate, more deeply, less densely punctulate, and the elytra are more parallel, the striæ and puncturation are coarser, and there is a distinct greenish-æneous tinge, instead of being subopaque black. There are very distinct seriate punctures on the third and fifth and two punctures below the shoulders of the seventh. The same differences that oblige me to separate "*differens*" and "*integer*" apply in this species.

A second species, also a female, captured by the Rev. J. A. O'Neil at Salisbury, S. Rhodesia, has the following dimensions: 9½ mm. long by 3½ mm. wide. The prothorax is less transverse, the sides similarly rounded but a little more contracted to base. Head and prothorax have a faint greenish-æneous sheen; the elytra is elliptical in shape and obscurely iridescent; the striation and puncturation are similar and the intervals equally plane, but the seriate punctures on the third and fifth intervals are more spaced and much more distinct. The colour of the antennæ, palpi, and legs is paler testaceous yellow, especially the last.

*Hypolithus dubius*, sp. n.

Length 7-7½ mm.; width 2½ mm. (♂ ♀).

Black, shining glabrous, obscurely iridescent; beneath ferruginous. Antennæ, palpi, labrum, mandibles (basally), and legs (brighter) testaceous yellow. Lateral margins of prothorax, medial parts of apex and base, scutellum, and lateral and apical margins of elytra testaceous red.

*Head* hardly perceptibly aciculate, very shiny, frontal and transverse grooves shallow and very fine.

*Prothorax*: front a little convex in the middle, shallowly depressed on either side between centre and angles, the latter rounded, not prominent, sides obliquely amplified to a little beyond middle, thence straight to posterior angles which are obtusely right; lateral margins anteriorly narrowly grooved and reflexed, more broadly and shallowly towards base; base wider than apex, medially broadly and shallowly emarginate; disc finely aciculate, a little rugulose frontally, more densely and rugosely punctate about basal area; median line short and basal depressions shallow.

*Elytra* at base hardly wider than prothorax, a little and gently amplified for some distance below shoulders, thence obliquely narrowing or tapering towards and hardly sinuate before apex; above deplanate, very shiny, finely striate, intervals quite plane, closely aciculate-punctate. Spaced punctures on third and fifth intervals.

The shape of the elytra in this species is very elliptic.

Boheman's description of his "*melancholicus*" might apply to this insect in most details, but his dimensions, 6½ mm. long by 3 mm. wide, depicts an extraordinarily short, squat insect unlike any *Hypolithus* I have yet met with. Péringuey's dimensions do not agree with those of the author, and it seems very doubtful whether he describes the same insect.

*Hab.* Salisbury, S. Rhodesia. Male and female examples received from the Rev. J. A. O'Neil.

I have a single male example of a very nearly-related species, from Nkusi River, Zululand, which is shaped almost exactly like "*dubius*"; it is, however, a little larger (8 mm. by 3 mm.), the ground-colour is a deeper jet-black, and it has no trace of iridescence; the labrum and mandibles are wholly black and there is no diffused reddish about the apex or base of prothorax, scutellum, or margins of the elytra. The striation and puncturation of elytra are coarser and there are well-defined spaced punctures on the third, fifth, and seventh intervals.

*Hypolithus castaneus*, sp. n.

Length  $6\frac{1}{2}$ – $6\frac{3}{4}$  mm. ; width  $2\frac{1}{4}$ – $2\frac{1}{2}$  mm.

Dark reddish brown, lateral margins of prothorax and elytra testaceous; antennæ, palpi, and legs (paler) testaceous yellow; labrum and epistome a shade lighter than ground-colour.

Head smooth or very faintly aciculate, frontal grooves obsolescent.

Prothorax transverse, plane, more than one-third wider than long, widest above middle; as wide at apex as at base, front nearly straightly truncate, angles rounded and hardly produced, sides from angles briefly amplified, thence straightly, a little inwardly inclined to posterior angles which are subacutely right; base shallowly emarginate medially, median line and basal foveæ shallow, the latter coarsely, rugosely punctate, the rest of the disc more or less densely aciculate-plicate.

Elytra narrow, elongate, base confluent with prothorax, very little amplified below shoulder, thence nearly parallel for two-thirds the length, and gently, a little sinuately rounded to apices; depressed above, very deeply striate, the first two or three intervals more or less carinate, puncturation moderately dense and somewhat coarse. Seriate punctures on third, fifth, and seventh intervals.

The ampliation of prothorax below front angles is briefer than in "*dubius*" and the sides of elytra are parallel, not at all elliptic; the sculpture is much coarser throughout and colour different. There are seven examples before me for comparison, and the darkest among them is of only a slightly duskier tint of chestnut-brown than its fellows. It can therefore be safely concluded the coloration is not due to immaturity.

Hab. Salisbury, S. Rhodesia, from the Rev. J. A. O'Neil. It is evidently a common species.

*Hypolithus propinquus*, sp. n.

Length  $6\frac{3}{4}$ – $7\frac{1}{2}$  mm. ; width  $2\frac{1}{4}$ –3 mm.

Head and prothorax piceous to deep reddish brown; elytra (except epipleuræ, which are red) black, more or less obscurely iridescent; beneath deep reddish brown; antennæ, labrum, and palpi reddish testaceous; legs pale testaceous yellow. Sides of prothorax broadly, somewhat suffusedly margined with testaceous.

*Head* smooth or finely aciculate, shiny, frontal foveæ and transverse suture very fine.

*Prothorax* very transverse, more than one-third wider than long, apex truncate and convex medially, a little sinuate and very declivous to frontal angles, which are briefly rounded and produced; sides gently rounded to about middle, straightly and very slightly contracted to hind angles, which are obtusely right; base nearly  $\frac{1}{2}$  wider than apex, shallowly emarginate medially, more or less finely, transversely aciculate on disc, densely, confluent punctate about sides and broad, shallow basal depressions; median line fine and short, reaching neither apex nor base.

*Elytra* truncate, hardly wider than prothorax at base, humeral angles sharply quadrate, very briefly widened below, sides straight and parallel to beyond middle, then gently, hardly sinuately rounded to apices; nearly plane above, moderately deeply striate, intervals densely punctulate and quite plane. Spaced punctures on third, fifth, and seventh intervals.

Closely allied to *H. castaneus*, mihi. Prothorax a trifle more transverse, otherwise similar; elytra equally parallel-sided, but less narrowly elongate, and the puncturation a little finer. Apart from the colour, which is quite different, the iridescence is usually less obscure, though as in *castaneus* it is sometimes altogether wanting.

The dimensions of "*propinquus*" agree well with those of Péringuey's (not Boheman's) "*melancholicus*," and it is quite possible that it may be that insect, especially as it appears to be a common insect with a fairly wide coastal range. Péringuey, however, states that there are only seriate punctures on the third and faintly on the fifth. In all the examples before me these punctures are present on intervals 3, 5, and 7, though sometimes they are not very conspicuous on the two latter intervals.

*Hab.* Natal Coast; Delagoa Bay and Inhambane (Mozambique Prov.). A common species. Examples from Mozambique are a little more robust and more roughly sculptured.

### *Hypolithus turbatus*, Pér. ?

I have four specimens which agree fairly well with the description of above (*vide* Ann. S. Afr. Mus. vol. v. p. 279), but they are considerably smaller, *i.e.*  $6\frac{1}{2}$  mm. long by  $2\frac{1}{4}$  mm. wide. Those of "*turbatus*" are given as  $7\frac{1}{2}$  mm. long by  $2\frac{3}{4}$  mm. wide.

The specimens before me are ænescent shiny and obscurely iridescent in the males; those which I take to be females show no iridescence, and the elytral margins are only obscurely and narrowly bordered with testaceous red. Three out of four of these have remote punctures on intervals 7, as well as on 8 and 5, but they are very faintly defined.

The type or types from which "*turbatus*" was described were collected by Dr. (then Mr.) G. A. K. Marshall at Salisbury, S. Rhodesia, and those now before me are all from the same locality, collected by the Rev. J. A. O'Neil.

Another ? distinct species from the same locality of the same size and shape is only differentiated from "*turbatus*" by details of the sculpture and coloration, but it will require much more material than I have now to decide upon its relationship to the above.

#### XLIII.—*Exotic Muscaridæ (Diptera)*.—VII.\*

By J. R. MALLOCH, Washington, D.C.

##### Subfamily *PHAONINÆ*.

##### *Mydæa contraria* (Walker).

Stein placed this species in his key to the Oriental species of *Mydæa*, but gave it the new name *spinipes*, with *contraria*, Walker, in parenthesis. He did not, so far as I know, describe the species. The specimens I have before me are in poor condition, but the species is evidently very close to typical *Mydæa*. The fourth vein is slightly curved forward apically, and in no respect does it differ very much from *Myiospila*, R.-D., the nearest relative to *Mydæa*. Without better material of both sexes I do not care to give a definite opinion as to the generic position.

The hind femora have very short, closely-placed bristles on the antero-ventral surface apically.

Locality, Singapore (*H. M. Ridley*).

##### *Helina rufithorax* (Stein).

A rather conspicuous species, with black head and abdomen and the thorax reddish-yellow with a black mark on metanotum. In the female before me the femora are

\* For Part VI, see Ann. & Mag. Nat. Hist. (9) x., July 1922, pp. 132-144.



darkened above, the wings have the cross-veins infuscated, the arista is plumose, the thorax has three pairs of strong postsutural dorso-centrals and no presutural acrostichals. The mid-tibia has an antero-dorsal median bristle, the hind tibia one antero-ventral and two antero-dorsal bristles.

Locality, top of the Aberdare Mts., Kenya Colony (T. J. Anderson). Originally described from East Africa in 1914.

### Subfamily CÆNOSIINÆ.

#### Genus PYGOPHORA, Schiner.

I present herein a key to the species of this genus known to me. It is not possible from a study of the material available to me to make a complete key to the females.

I recapitulate the generic characters cited in Part I. of this series of papers:—Arista remarkably long-haired to middle; frons much wider at anterior margin than at vertex, each orbit with four bristles, one in line with the anterior ocellus and three strong bristles anterior to it, the upper two very close together; mid-tibia with no anterior bristle; hind tibia with one antero-ventral and two postero-dorsal and antero-dorsal bristles.

#### Key to Species.

##### Males.

- |   |                            |
|---|----------------------------|
| 1. Wing with a fuscous spot at apex of second vein .....  | 2.                         |
| Wing without fuscous spot .....   | 5.                         |
| 2. Hind tibia without a lobuliform process at apex on ventral surface; fourth tergite with a slight apical lobe in centre, which is furnished with long, strong, downwardly-directed bristles .....   | <i>aliena</i> , sp. n.     |
| Hind tibia with a lobuliform process at apex on ventral surface .....   | 3.                         |
| 3. Hind tibia with a series of bristles on apical half of postero-ventral surface which become longer apically; the dark spot at apex of second vein connected with a similar spot on third vein below it; mid-femur with long bristles on basal half of antero-ventral surface ..... | <i>apicalis</i> , Schiner. |
| Hind tibia without a series of bristles as above, with from one to three bristles at middle on postero-ventral surface; no spot on third vein, the one on apex of second barely reaching third vein ....  | 4.                         |
| 4. Hind tibia with three bristles at middle on  |                            |

- postero-ventral surface; mid-femur with long stout bristles on basal half and a comb-like series of short setulæ on apical half of antero-ventral surface .. *maculipennis*, Stein.
- Hind tibia with one bristle at middle on postero-ventral surface; mid-femur with long bristles on entire antero-ventral surface ..... *nigricauda*, Bigot.
5. Hind tibia with an apical process on ventral surface ..... 6.
- Hind tibia without an apical process on ventral surface ..... 8.
6. Fourth abdominal tergite compressed and with a lobuliform process in middle of posterior margin; hind tibia without bristles on apical half of postero-ventral surface ..... 7.
- Fourth abdominal tergite not produced into a lobe at apex in centre; hind tibia with a few short bristles on apical half of postero-ventral surface ..... *australis*, sp. n.
7. Fourth tergite with sparse bristles on sides. *lobata*, Stein.
- Fourth tergite with dense bristles on sides. *semilutea*, Malloch.
8. Small species, 3.5 mm. in length; sides of abdominal tergites 3 to 5 each with many long scale-like bristles; third antennal segment largely brownish .... *minuta*, Malloch.
- Larger species; tergites without scale-like bristles ..... 9.
9. Humeri and apex of scutellum yellow; large species 7 mm. in length ..... *humeralis*, Stein.
- Humeri and scutellum black or grey .... 10.
10. Mid-femur with long bristles on basal half and a comb-like series of short setulæ on apical half of antero-ventral surface; fourth tergite not compressed at apex above ..... *parvipuncta*, Stein.
- Mid-femur without a comb-like series of setulæ on apical half of antero-ventral surface; fourth tergite compressed at apex above ..... *immaculipennis*, Frey.

### Females.

1. Femora almost entirely black ..... *torrida*, Wied.
- Legs yellow ..... 2.
2. Humeri and apex of scutellum yellow .... *humeralis*, Stein.
- Humeri and scutellum black or grey .... 3.
3. Only the basal abdominal tergite yellow.. *apicalis*, Schiner.
- Abdomen almost entirely yellow, black-spotted ..... *lutescens*, Frey.
- Two basal abdominal tergites yellow .... *immaculipennis*, Frey

### *Pygophora aliena*, sp. n.

*Male*.—Similar to *apicalis* in colour. Black, densely pale grey-pruinose; frons anteriorly, face, antennæ, palpi, and

legs, and most of basal three tergites of abdomen yellow. Third and fourth tergites each with three fuscous spots in a transverse series. Wings with a large spot, which is sometimes rather faint, before apex of second vein, which fills the subcostal cell and usually extends almost or quite to third vein.

Lateral margins of fourth tergite entirely covered with long dense inwardly-curved black bristles, and, ventrad of these, two tufts of longer bristles, one on each side; basal portion of hypopygium with fine, slightly curled hairs above, and with more sparse hairs and some long setulose hairs at apex. Mid-femur with two or three long fine bristles on basal half of antero-ventral surface, and a few short fine bristles on postero-ventral surface; hind tibia slender, simple, with three stout short bristles on apical half of postero-ventral surface.

*Female*.—Similar to that of *apicalis*, the thorax more distinctly vittate.

Length 5–6 mm.

*Type*, male, Kuranda, North Queensland, 13. v.–20. vi. 1913, 1100 feet (*R. E. Turner*); allotype, topotypical, 21. vi.–25. vii. (*R. E. Turner*); paratypes, one male and four females, Babinda, North Queensland (*J. F. Illingworth*) [*U.S. Nat. Mus.*].

*Pygophora apicalis*, Schiuer.

This is the genotype. Originally described from Australia. I have before me one male and one female from Victoria (*C. French*), two females from Neutral Bay, Sydney, New South Wales (*J. B. Cleland*), and one female from Burpengary, Queensland (*T. L. Bancroft*).

*Pygophora maculipennis*, Stein.

Originally described from Krakatau, Dutch East Indies. I have before me two males and two females from Ceylon (*Yerbury*). The female, like that of *apicalis*, lacks the dark spot on costa of the wing, and is distinguished from that species by the absence of thoracic vittæ.

*Pygophora nigricauda*, Bigot.

Originally described from Ceylon. Unknown to me except from description.

*Pygophora lobata*, Stein.

Originally described from New Guinea. I have before me one male from Christmas Island (*C. W. Andrews*).

*Pygophora australis*, sp. n.

*Male*.—Similar to the male of *apicalis* in colour, and structurally similar also. The absence of the dark spot on the costa of the wing is about the only character separating it from that species, of which it may yet prove to be merely a variety.

Length 5 mm.

*Type*, Burpengary, Queensland (*T. L. Bancroft*).

*Pygophora minuta*, Malloch.

Originally described from Australia.

*Pygophora humeralis* (Stein).

An African species. Described as a *Cænosiæ*. I have seen many specimens.

*Pygophora parvipuncta* (Stein).

An African species. Described as a *Cænosiæ*. Unknown to me.

*Pygophora immaculipennis*, Frey.

Originally described from Ceylon. A true *Pygophora*, though Stein placed it in *Cænosiæ* in his catalogue of the world's Anthomyiidae. I have before me four males from Ceylon.

*Pygophora torrida*, Wiedemann.

*Female*.—Similar in general colour to the female of *apicalis*. The antennae dusky yellow. Abdomen more shining than in that species, the lateral spots fused and very large, covering the larger part of tergites on sides. Femora except their apices black, tibiae and tarsi tawny. Wings yellowish. Legs as in *apicalis*, but in one specimen the mid-tibiae have a distinct antero-dorsal bristle at middle.

Length 5 mm.

Locality, Sumatra, Sungei Penok, Korinchi Valley, 2600 feet.

A second specimen from Sunkei, Siam (*Robinson and Annandale*), lacks the mid-tibial bristle and has the abdominal spots separated and smaller, and may be distinct.

*Pygophora lutescens*, Frey.

Originally described from a female from Ceylon. Unknown to me.

Subfamily *LISPINÆ*.*Xenolispa atrifrontata*, Malloch.

I described this species in Part V. of this series of papers, but had before me at that time only the female of the species. Since then I have found a series of both sexes, and give notes on the allotype below.

Similar to the female in colour. Differs in having the first two tergites greyish on posterior margins, the third with a large round white spot on each side anteriorly and a subtriangular spot on middle of hind margin, and the fourth tergite with the marks similar, but the anterior pair closer together and smaller, and the one on posterior margin smaller. The hind femora are slightly curved, and have near the base on the ventral surface a series of long closely-placed setulose hairs that slope slightly basad and are flexed at middle, their apical portions hair-like. The hind tibia is slightly curved, about twice as thick as mid pair, and has some setulose hairs apicad of the bristle on the antero-dorsal surface, which are hooked at apices. Basal segment of hind tarsi with long setulose hairs on anterior side. Fifth sternite twice as long as fourth, asymmetrical and with a rounded lobe at apex.

Length 5-6 mm.

Allotype and one male paratype, Burpengary, South Queensland; three males and two females, Queensland (*T. L. Bancroft*).

In the original description the hind tibial bristle is erroneously stated to be on the postero-dorsal surface. The species is very close to *albimaculata* (Stein), but that species has the fore coxæ yellow and the wings slightly infuscated, with white tips in both sexes.

*Lispa pumila*, Wiedemann.

This species was redescribed by Stein as *ignobilis*. A true *Lispa*, with two strong and two very weak pairs of post-sutural dorso-centrals, three sterno-pleurals, and the bristles on postero-ventral surface of fore tibiæ long and strong. The thorax is densely grey pruinulent with three fuscous vittæ, the abdomen pale grey pruinulent with two large blackish spots on each side of each tergite, the legs are black with the tibiæ and tarsi tawny, and the wings are hyaline. The mid and hind femora in the male have some long fine ventral bristles which are absent in female, and both sexes have a strong antero-dorsal and a weaker antero-ventral

bristle. There are four or more long bristles on apex, and one on each side near base on fourth tergite in both sexes.

Length 4–5 mm.

Five specimens, Burpengary, South Queensland (*T. L. Bancroft*); one female, Trincomali, Hot Wells, Ceylon, 27. vii. 1890 (*J. W. Yerbury*).

*Xenolispa mirabilis* (Stein).

This peculiar species is referable to *Xenolispa*. It has the vertical bristles weaker than in *atrifrontata*, but like that species it has the outer pair very weak and small. The parafacials are bare or almost so, the arista very short-haired. There are three fuscous vittæ on thorax, the prescutellar pair of dorso-centrals are very small and weak, the sterno-pleural is strong, and the stigmal bristle is hair-like and short; scutellar bristles short, the apex of scutellum with a dark spot. Basal tergite with a pair of contiguous spots at base, the other tergites each with a pair of curved fuscous spots. Legs slender, blackish, with grey pruinescence, the tibiæ tawny; mid-tibia with the postero-dorsal bristle and hind tibia with the antero-dorsal bristle weak. Fore femur with only fine hairs ventrally.

Stein describes the male as having the fore tarsus whitish, and broadened as in many species of the Syrphid genus *Platychirus*, and the hind tibia with a fringe of fine hairs. I have seen only the female, which has the fore tarsus short but of normal form, and the hind tibia without a fringe.

Originally described from India. I have before me two females from Phrapatoen, Siam, 18. i. 1907 (*P. G. Woolley*), and three from Trincomali, Ceylon, vii.–viii. 1890 (*J. W. Yerbury*).

*Xenolispa yerburyi*, sp. n.

*Male*.—Black, shining, the abdomen almost glossy except on the pale pruinose spots. Frons black, ocellar triangle shining; orbits at bases of antennæ silvery; face and cheeks yellow pollinose; antennæ black; palpi yellow, silvery apically. Thorax with brownish pruinescence on dorsum, very indistinctly vittate; pleuræ densely whitish pruinescent; scutellum black. Abdomen with a large brownish-grey pruinose spot in middle of posterior margin of first tergite, the third with a large subquadrate whitish spot on each side anteriorly; venter grey-pruinose. Legs black, grey-pruinescent; trochanters, extreme apices of femora, and bases of tibiæ tawny. Wings greyish. Calyptreæ and halteres yellowish.

Ocellar triangle slender, extending to anterior margin of frons; parafacials linear, with a few weak hairs; antennæ not extending much below middle of face; arista plumose; vibrissæ distinct, well above mouth-margin; proboscis stout. Stigmatal bristle weak; humeral weak or absent; sometimes a weak setula in front of the prescutellar pair of dorso-centrals. Abdomen as in *atrifrontata*, Malloch; the fifth sternite very long and asymmetrical at apex. Fore tibia without a median bristle; fore tarsus normal, without the dilation of apical two segments as in *atrifrontata*; mid-tarsus with long hairs on ventral surface of basal segment, especially apically; hind femur with four or five long bristles on basal half of ventral surface, which are very fine apically and are not so closely placed as in *atrifrontata*, nor flexed as in that species; hind tibia curved, thickened and with short hairs on apical half; hind tarsus with basal segment thickened.

*Female*.—Differs from the male in having the mid and hind tarsi normal, the hind femur lacking the ventral bristles, the hind tibia less curved and not so thick apically, and third and fourth tergites with a pale spot in hind margin.

Length, ♂ 4 mm., ♀ 5 mm.

*Type*, male, Trincomali, Hot Wells, Ceylon, 12. vii. 1891; allotype, topotypical, 2. viii. 1891; paratypes, one male, topotypical, 24. ii. 1892; one female, Hinanduma, Ceylon, 28. iv. 1892; one female, Kanthalai, Ceylon, 8. iii. 1892; one female, Perivipancheram, Ceylon, 9. iii. 1892.

The last specimen differs from the others in having the face almost white instead of yellowish, but I believe it to be the same species.

Named in honour of the collector, Col. J. W. Yerbury.

This and the other species of the genus resemble *Lispa pallitarsis*, Stein, which also belongs to *Xenolispa*, but that species has the fore tarsi largely whitish.

#### Genus CHÆTOLISPA, nov.

*Generic characters*.—Differs from *Lispa* in having a strong bristle on parafacial close to lower anterior margin of eye. Dorso-centrals 2 + 3; sterno-pleurals 3; each tibia with from 3 to 5 apical long spurs; mid-tibia with an antero-dorsal and a postero-dorsal bristle; hind tibia with three median bristles, one antero-dorsal, one antero-ventral, and one postero-dorsal. First posterior cell not narrowed apically.

*Genotype*, *Lispa geniseta*, Stein.

I have before me two females of this species from Trincomali, Ceylon, 1. x. 1890 (*J. W. Yerbury*).

Originally described from Java and recorded at the same time from Australia.

*Lispa sericipalpis*, Stein.

I have before me one male of this species. An entirely black species, opaque, the body covered with yellowish or brownish pollinosity, which is sericeous on face and palpi. The abdomen has a pair of large contiguous curved brown spots on tergites 2 to 4, which are slightly shining. The legs are slender, without conspicuous armature, the mid and hind tibiæ having their one median bristle very short, and the femora of the same legs with some long setulose hairs on basal half ventrally.

Originally described from Java. The specimen before me is from Nuwara Eliya, Ceylon, 14. vii. 1892 (*J. W. Yerbury*).

*Lispa inæqualis*, sp. n.

*Male*.—A pale grey-pruinescent species, the basal two antennal segments, palpi, tibiæ, and tarsi tawny, the tibiæ a little darkened apically. Thorax without distinct vittæ, and with three pairs of postsutural dorso-centrals, the anterior two pairs weak. Abdomen with a pair of elongate fuscous-brown spots on second and another on third tergite, fourth with two series of long bristles, one near base and the other near apex; basal portion of hypopygium, sides of fourth tergite, and a narrow transverse stripe on anterior and posterior margins of second and third tergites fuscous. Fore tibia with a long median posterior bristle; mid-tibia with a posterior median bristle; hind femur with one or two fine bristles on basal half of postero-ventral surface and one beyond middle on antero-ventral surface; hind tibia with some fine hairs ventrally, which are noticeable only on apical half, one long fine antero-ventral bristle beyond middle, and the apical dorsal bristles long and fine; hind tarsus with the basal segment very conspicuously dilated, shorter than second, and extending along the base of latter on its posterior side; tarsal claws very long, the pairs on fore and mid legs very unequal in length. First posterior cell narrowed slightly at apex.

Length 5 mm.

*Type*, Patani Cape, Siam, 7. vi. 1901 (*H. C. Robinson* and *N. Annandale*).

Very similar to *metatarsata*, Stein, but that species has the first posterior cell not narrowed apically, the tarsal claws short, and the antennæ shorter, as well as the hind tibia with more conspicuous soft hairs.



*Lispa glabra*, Wiedemann.

The male of this species is quite the most remarkable of the genus. The mid-femur is slightly distorted, and has on the basal two-thirds of the postero-ventral surface a dense series of black bristles, which are turned anteriorly and have their apices curled, and between the bristles dense black hairs which form with them a compact brush-like fringe; the mid-tibia is slightly dilated apically and has some long black hairs on the apical fourth ventrally, and the mid-tarsus has a dense fringe of short black hairs along the posterior side of the basal segment; except for the very long tarsi, the hind legs are normal. The wings are very noticeably pointed, the first posterior cell is almost closed, and ends in the margin just before apex of wing; the outer cross-vein runs parallel to the margin of wing, and the fifth does not extend beyond outer cross-vein. There is in addition a peculiar stripe of lengthened hairs on the wing, which lies between the outer cross-vein and margin and runs the whole length of apical margin of wing.

The female lacks all those characters and looks like a different species, but the first posterior cell is narrowed at apex, and by that character it may be separated from its allies except the next species, which has been confused with it by previous authors.

This species has two synonyms, *dilatata*, Wiedemann, and *grandis*, Thomson.

Length 8-9 mm.

Localities, six specimens from Ceylon, as follows: male and female, Trincomali, Hot Wells, 27. vii. and 17. viii. 1890; female, Kanthalai, 31. vii. 1890; three females, 1. iii. 1891 (*J. W. Yerbury*).

*Lispa modesta*, Stein.

*Male and female*.—Similar to *glabra* in colour, but the face and cheeks with yellow pollen instead of white pruinescence. The male and female are similar to *glabra* female in armature of the legs, differing only in having the fore femur with an almost complete series of postero-ventral bristles instead of but one or two at apex. The wings are the same in both sexes, and differ from those of the female *glabra* only in having the outer cross-vein slightly bent and nearly erect instead of very oblique.

Length 7 mm.

Stein has reduced this to a variety of *assimilis*, Wiedemann, but I regard it as a good species. It was originally described from Africa, from where I have seen three females, I have

also before me eleven females from Ceylon (*J. W. Verbury*), and have seen two males and one female from the Philippine Islands (*C. F. Baker*).

*Lispa weschei*, sp. n.

*Male*.—Black, shining. Frons brownish black, opaque; face, cheeks, and occiput with dense white pruinescence; antennæ black, apex of second segment reddish; palpi whitish yellow. Thorax brownish pruinulent on dorsum, with three shining black vittæ; pleuræ densely whitish-grey pruinulent. Abdomen with a pair of curved shining black marks, which are contiguous basally, on second, third, and fourth tergites. Legs brownish fuscous, grey-pruinulent, tibiæ tawny. Wings clear. Calyptræ whitish. Halteres yellowish.

Arista long plumose; antennæ not much shorter than face; parafacial with sparse hairs; palpi gradually dilated. Thorax with two strong prescutellar pairs of dorso-centrals, the two anterior pairs behind suture and the two pairs in front of it almost indistinguishable; pleural bristles normal. Abdomen rather broad; basal sternite hairy; fourth long, not armed at apex, fifth notched in centre. All coxæ, and especially the fore pair, the trochanters, and the bases of all femora with very long setulose hairs which are crinkly at apices; fore tibia with an antero-dorsal and a posterior median bristle; mid-tibia with one posterior bristle; hind femur without strong bristles; hind tibia with one antero-ventral, one antero-dorsal, and one postero-dorsal bristle at middle; tarsi normal. Outer cross-vein regularly curved; first posterior cell narrowed apically.

Length 5 mm.

*Type*, Port Melbourne, Victoria, 10. xii. 1906 (*W. Wesché*).

Named in honour of the collector, who did some very fine work on Diptera.

*Lispa uniseta*, sp. n.

*Female*.—Similar to the preceding. Differs in having the tibiæ slightly darker; the thorax with one pair of presutural and two pairs of postsutural dorso-centrals, all very long and strong; the fore tibia with one very long posterior bristle, and none on antero-dorsal surface; the mid-tibia with an additional bristle on antero-dorsal surface; and the mid and hind femora with a few setulose hairs at base.

Length 5 mm.

*Type* and one paratype, Port Melbourne, 10. xii. 1906 (*W. Wesché*).

Possibly the female of *weschei*, but if so, an abnormal case in the genus.

*Lispa neo*, sp. n.

*Female*.—Similar in general colour and habitus to *tentaculata*, De Geer. Tibiæ, apices of femora, and base of mid-metatarsus tawny. Wings slightly brownish. Abdomen with two large subtriangular shining black spots on tergites 2 to 4, which are separated centrally by a narrow whitish line, the anterior lateral angles of each tergite conspicuously whitish.

Parafacials linear, much narrower than in *tentaculata*; palpi narrower than in that species, very little dilated. Thorax with dorso-centrals 2+4, the anterior two pairs behind the suture very weak and small. Fore tibia with an antero-dorsal and a posterior bristle at middle; mid-tibia with a posterior median bristle; hind femur with a fine bristle near middle on postero-ventral surface and a strong one near apex on antero-ventral surface; hind tibia with an antero-dorsal and an antero-ventral bristle at middle; mid-metatarsus long and slender. First posterior cell not appreciably narrowed apically.

Length 7 mm.

*Type* and one paratype, Sekondi, Ashanti, 19. ix. 1906 (W. M. Graham); one paratype, Gambia, 24. iv. 1911 (J. J. Simpson).

*Lispa canis*, sp. n.

*Male*.—Black, slightly shining. Frons black, subopaque except on the triangle; orbits, face, and cheeks yellow pollinose, almost golden; occiput whitish pruinose; antennæ and palpi black or fuscous. Thorax brownish pruinose on dorsum, indistinctly vittate, lateral margins and pleuræ densely whitish-grey pruinose. Abdomen brownish pruinose on venter, the dorsum densely whitish pruinose, the disc of each tergite more brownish and with a pair of fuscous spots which are most distinct in centre anteriorly on each, a large area on sides of each tergite almost white and nearly bare; hypopygium black. Legs black, bases of fore tibiæ and the mid and hind pairs except their apices tawny. Wings slightly yellowish. Calyptre whitish. Halteres yellow.

Space between eyes when seen from in front much narrowed at bases of antennæ, the latter of normal length; arista plumose; parafacials narrow, hairy; palpi distinctly but not very conspicuously broadened apically. Thorax

with two pairs of strong prescutellar dorso-centrals, the others almost indistinguishable. Abdomen narrowly ovate; fourth tergite with a stout bristle at apex on each side; basal sternite hairy, fourth with the hairs more dense at apex in centre than elsewhere. Fore tibia stout, unarmed at middle; mid-tibia with one posterior bristle at middle; mid-metatarsus long and slender; hind femur with one bristle near middle on antero-ventral surface and one pair near apex on postero-ventral; hind tibia nearly straight, with rather conspicuous setulose hairs on anterior side and shorter hairs ventrally on apical third, antero-dorsal bristle among the long hairs, postero-dorsal bristle small; hind metatarsus slender, with a fringe of erect curled fine hairs on anterior side, which are barely as long as the diameter of the segment; claws small. First posterior cell not narrowed apically.

*Female*.—Similar to the male. The only specimen before me lacks the hind legs, but I assume that, as in other species, these must differ from those of the male in having no setulose hairs and but the two bristles, and the tarsi will have the normal form and hairing.

*Type*, male, and allotype, Nilaveli, Ceylon, 16. & 11. xi. 1890. Paratypes, one male, Kanthalai, Ceylon, 11. iii. 1892; one male, Maighini, Ceylon, 17. xi. 1890 (*J. W. Yerbury*).

#### *Key to Genera of Lispinæ.*

- |  |                              |
|--|------------------------------|
| 1. Cheek with a strong bristle near lower anterior angle of eye.....   | <i>Chatolipsa</i> , Malloch. |
| Cheek without such bristle.....  | 2.                           |
| 2. Thorax with only one pair of dorso-centrals; fore femur with only one or two short bristles near apex on postero-ventral surface..... | <i>Xenotipsa</i> , Malloch.  |
| Thorax with at least two distinct pairs of dorso-centrals, and a series of bristles on postero-ventral surface of fore femur.....        | <i>Lispa</i> , Latreille.    |

XLIV.—*On Mammals from the Yunnan Highlands collected by Mr. George Forrest and presented to the British Museum by Col. Stephenson R. Clarke, D.S.O.* By OLDFIELD THOMAS.

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THE National Museum owes to the generosity of Col. Stephenson R. Clarke the fine collection of mammals found by Mr. George Forrest in the high mountain area of Northern Yunnan and North-Eastern Burma, about N. lat.

27°-28°, in the region where the upper waters of the Irrawaddy, the Salween, the Mekong, and the Yang-tse approximate to each other and form a remarkable district of alternating mountains and valleys perhaps unequalled for diversity of surface in any part of the world. Mr. Forrest has been collecting plants in this area for some time, and in 1918 had obtained a few mammals, among which were the two new forms of *Tamias* described by me in 1920\*. Col. Clarke was then good enough to influence Mr. Forrest to turn his attention to small mammals, and in the collection of these, as of birds, he has proved to have great abilities, so that the present set is one of the most interesting collections that the Museum has received for many years. Geographically it fills a very important lacuna between the collections made in Northern Burma on behalf of the Bombay Natural History Society and those obtained by Mr. Malcolm Anderson in Sze-chwan when carrying out the Duke of Bedford's exploration of Eastern Asia.

Isolated collections have also been made in this area by Mr. E. B. Howell and Mr. F. Kingdon Ward, and to them we owe the first discovery of several of the smaller forms now sent by Mr. Forrest.

The whole collection consists of nearly 250 specimens, of which about 100 are voles, and have been reserved for a separate paper by my colleague Mr. Hinton. The remainder belong to 32 species, including 7 now described as new.

Of these novelties, one is an exceptionally beautiful Flying-squirrel, which I have named in honour of the donor, and another forms a new genus of *Sciuridae*, and is therefore of great zoological interest. The specimens of a new species of a *Uropailine* Insectivore are also especially welcome.

1. *Barbastella darjelingensis*, Hodgs.

♂. 470. Wei-Hsé Valley, 27° N. 7000-8000'.

2. *Tadarida teniotis cæcata*, subsp. n.

♂. 403. Mekong Valley, 28° 20'. 7000'. 29th September, 1921. B.M. no. 22. ♀. 1. 2. *Type*.

Quite similar in size and general characters to true *teniotis*, but colour much darker. Upper surface uniform dark "mummy-brown," the extreme bases of the hairs only whitish. In Portuguese and Egyptian specimens the general colour is more or less drab. Under surface very slightly paler.

Skull and teeth as in *teniotis*.

\* Ann. & Mag. Nat. Hist. (9) v. p. 304 (1920).

Dimensions of the type:—

Forearm 60 mm.

Head and body 89; tail 55. Metacarpus of third digit 63, of fifth 34.

Skull: greatest length 24·8; basi-sinual length 19·7.

Although in all essential characters this bat appears to be identical with the S.-European *T. toniotis*, the difference in its colour is sufficiently marked to render a subspecific name advisable for it, especially when the immense difference in locality is considered.

### 3. *Tupaia belangeri chinensis*, And.

♂. 452, 453, 484, 534, 568, 570; ♀. 415. Li-kiang Range, 27° 30'. 9000–11,000'.

♂. 626. Hills east of Li-kiang Valley, 27°. 10,000'.

♂. 402. Mekong-Salween divide, 27° 30'. 9000–10,000'.

♀. 30. Mekong Valley, 27° 30'. 5000'.

Modern specimens from Ponsee, Kakhyen Hills, the type-locality of *chinensis*, would be of service in identifying Anderson's species with certainty; but there is little doubt that the present specimens are referable to it.

### 4. *Scaptonyx fuscicaudatus affinis*, Thos.

♂. 33. Mekong-Salween divide, 28° N. 7000–8000'.

Practically a topotype of the subspecies, and only the second specimen of this remarkable genus that the Museum has received.

### 5. *Nasillus investigator*, sp. n.

♂. 185; ♀. 182, 183, 184, 186, 312. Kiu-kiang-Salween divide, 28° N. 11,000'.

♀. 217. Salween-Mekong divide, 28° N. 14,000'.

Externally quite like *N. gracilis*—indeed, all the members of the three genera *Uropsilus*, *Rhynchonax*, and *Nasillus* are hardly distinguishable from each other.

Essential characters of the dentition as in *N. gracilis*, the formula the same in all the specimens. Skull, however, conspicuously larger, both longer and, especially, broader, the brain-case much wider.

Dimensions of the type (measured in the flesh):—

Head and body 88 mm.; tail 62; hind foot 14; ear 10.

Skull: greatest length 21·4; condylo-basal length 20;

zygomatic breadth 10·3; interorbital breadth 5·2; breadth across brain-case 11; length of upper tooth-series 9·1.

*Hab.* as above. Type from the Kiu-kiang-Salween divide at 28° N. Alt. 11,000'.

*Type.* Immature female (the milk-teeth still in place, but the skull quite of full size). B.M. no. 22. 9. 1. 16. Original number 184. Collected 24th July, 1921.

Although not of the showy character of the new *Petaurista* and the new genus of squirrels, this little animal is of very special interest, as it confirms the division of the members of the Uropsilinae into three genera—a division about which I felt most diffident. The identity of the external characters and of the skulls, even when combined with the differences in the dental formulæ, made the division one of some doubt, for it seemed possible that the formulæ might be unusually variable. This series, therefore, all absolutely agreeing in formula with *Nasillus*—a genus of which I only had one specimen before,—is of much value as confirming the characters used.

As a species *N. investigator* is readily distinguishable from *N. gracilis* by its larger skull. The locality of the latter is in a different faunal area, much further eastwards, and at an altitude of only 4000'.

#### 6. *Sorex bedfordiæ*, Thos.

♂. 150, 159. Mekong Valley, 28° N. 9000'.

♂. 202, 345; ♀. 275. Mekong-Salween divide, 28° 20'. 12,000–14,000'.

♀. 187. Kiu-kiang-Salween divide, 28° N. 11,000'.

The Kiu-kiang-Salween divide locality forms the first record of the striped shrew in British territory.

#### 7. *Blarinella wardi*, Thos.

♂. 216. Mekong-Salween divide, 28° N. 14,500'.

♂. 320. Kiu-kiang-Salween divide, 28° N. 12,000'.

#### 8. *Crocidura* sp.

♂. 276. Mekong-Salween divide, 28° 20' N. 12,000'.

♀. 408, 569. Li-kiang Range, 27° 40'. 9000–13,000'.

*C. russula* group.

#### 9. *Paguma larvata yunalis*, Thos.

♀. 537 (young). Li-kiang Range, 27° 30' N. 11,000–12,000'.

10. *Charronia flavigula*, Bodd.

♀. 414. Li-kiang Range, 27° 40'. 10,000–11,000'.

11. *Lutreola sibirica moupinensis*, M.-Edw.

♂. 167, 223. Mekong Valley, 28° N. 7000'.

♀. 454. Li-kiang Range, 27° 30'. 12,000–14,000'.

It is impossible at present to express a definite opinion as to the position of these animals. Milne-Edwards described a number of Chinese species without any consideration of the wide differences that occur between the two sexes and the summer and winter pelages. It is, however, probable that his *moupinensis* is the same animal as those now obtained by Mr. Forrest, and I provisionally use that name.

There is some variation in the degree of blackening at the end of the tail, and it seems that my *Mustela hamptoni*, from Mt. Imaw Bum, should rather have been compared with the present animal than with *M. subhemachalana* of Nepal.

12. *Arctonyx obscurus*, M.-Edw.

♀. 538. Li-kiang Range, 27° 30' N. 10,000–12,000'.

In determining this badger my attention has been drawn to a specimen from the extreme east of China which has hitherto been referred to *A. obscurus*, but which appears to be worthy of subspecific distinction.

*Arctonyx obscurus incultus*, subsp. n.

Fur much poorer, thinner, and harsher than in *obscurus*. General colour dull whitish washed with black, the prominent whitish tips of the posterior dorsal fur found in *obscurus* almost entirely absent. Under surface very thinly haired, dull whitish washed with black. Crown and nape without a white central streak. Markings of head about as in *obscurus*.

Skull with comparatively broad muzzle, and with the posterior bony palate extremely inflated on each side, far more so than in any of the several West China specimens, from Ichang and westwards, in the Museum collection.

Dimensions (from skin) :—

Head and body (about) 700 mm.; tail 170; hind foot 89.

Skull: greatest length 134; condylo-basal length 128; zygomatic breadth 80; breadth of muzzle across roots of canines 28.5; interorbital breadth 33.3; breadth of posterior palate across inflations 27.7; longest oblique diameter of m<sup>1</sup> 15.



*Hab.* An-hwei, W. China. Type from Chin-teh (Tsing-tō of Stieler), about 150 km. W. of Hang-chow.

*Type.* Old male. B.M. no. 2. 6. 10. 35. Collected May 1896, and presented by F. W. Styan, Esq.

This animal has the characteristics of a low hot-country form, as compared with the comparatively rich-furred true *obscurus*. The unusual inflation of the posterior palate is also noteworthy.

13. *Lutra lutra nairi*, F. Cuv.

♀. 246. Mekong Valley, 28° N.

14. *Ailurus styani*, Thos.

♀. 627, 1234. Li-kiang Range, 27° 30' N. 11,000–12,000'.

These splendid specimens so confirm the characters, especially those of the skull, described when *A. fulgens styani* was founded, that I should now consider the Sze-chwan and Yunnan Panda as a different species from that of the Himalayas.

In coloration there is considerable variation between different individuals, 627 having a brilliantly black-ringed tail, while in 1234 the rings are no more prominent than they are in average *fulgens*. Both the Yunnan specimens are heavily blackened behind the shoulders and darkened across the withers, but the two Sze-chwan examples differ widely from each other in these respects. The face-pattern is also very variable.

15. *Ptaurista clarkei*, sp. n.

♂. 103, 227; ♀. 104, 105, 156, 160. Mekong Valley at 28° N. 9000–10,000'.

A beautiful grey-headed species with prominent buffy patches behind the ears.

Size about as in *P. marica* and other members of that group of the genus, smaller than in *nitida* and its allies. General colour of body above mixed blackish and buffy, the hairs blackish slaty for the greater part of their length, their tips buffy; laterally these tips become deeper-coloured, ochraceous on the top of the parachute. Under surface buffy whitish, gradually becoming rich ochraceous laterally, the throat whitish without buffy suffusion, the inguinal region greyish white with slaty bases to the hairs. Head contrasted dark grey—nearest to Ridgway's "deep quaker-drab,"—the face, crown to nape, and cheeks all of this colour; interramia

whitish and point of chin blackish. Ears large, thinly haired, almost naked except along their anterior edges, black, a large and prominent bright ochraceous patch on their posterior bases and behind them; this patch sometimes duller and mixed with brown. Upper surface of hands and feet, as also the margins of the parachute, anteriorly and posteriorly bright ochraceous buffy, the actual edge of the parachute, however, whitish. Tail subcylindrical, mixed buffy and black, the hairs black at base, then buffy, with black subterminal bands and buffy ends; tip of tail black.

Skull without noticeable peculiarities, rather longer than in *marica*; postorbital processes well developed; bullæ large and well inflated.

Dimensions of the type:—

Head and body 320 mm.; tail 370; hind foot 65; ear 50.

Skull: greatest length 63; condylo-incisive length 57; zygomatic breadth 40; nasals  $18 \times 11$ ; palatilar length 28·7; length of bulla 12·8; upper tooth-series exclusive of  $p^3$  13·5.

*Hab.* as above.

*Type.* Adult female. B.M. no. 22.9.1.44. Original number 156. Collected 26th July, 1921.

This beautiful grey-headed Flying-squirrel is so different from every described species that it is difficult to say with which it should be compared. It belongs to a small group of species occurring in the Yunnan-Burma-Siam region, all of which are brightly coloured and of smaller size than the better-known large species of true *Petaurista*. None of these, however, shows any resemblance to *P. clarkei* in its buffy colour, grey head, and ochraceous ear-patches.

I have great pleasure in naming this very handsome animal after Col. Stephenson Clarke, to whose generosity the National Museum owes the present valuable and extensive accession to its mammal collections.

"Shot in pine-forest."—*G. F.*

### 16. *Trogopterus mordax*, Thos.

♀. 228 (immature). Mekong Valley, on 28°. 9000'.

Adult examples of *Trogopterus* seem difficult to obtain, as a considerable proportion of the available specimens of the genus are immature.

### 17. *Callosciurus erythraeus michianus*, Rob. & Wr.

♂. 485, 628; ♀. 413. Li-kiang Range, 27° 30'. 8000–11,000'.

♂. 332. Mekong-Salween divide,  $28^{\circ} 20'$ . 7000-8000'.

♂. 416. Mekong Valley,  $27^{\circ} 30'$ . 7000'.

Of value as indicating the range of this form, whose locality—"Mee-Chee"—had not, I think, been definitely identified. Very uniform in colour as a whole, though one specimen has a marked tendency to the yellow sternal region said to be characteristic of *hæmobaphes*, Glover Allen, of S.E. Yunnan.

### 18. *Rupestes forresti*, gen. et sp. n.

♂. 26; ♀. 25, 27. Mekong-Yangtze divide on  $27^{\circ} 20'$  N. 7000-9000'.

### RUPESTES, gen. nov.

Related in essential skull-characters to *Sciurotamias*, but more like *Menetes* in general appearance externally. Body with a pair of whitish stripes. Anterior claws elongated, rather blunt. Soles naked except posteriorly, a long additional sole-pad (as compared with *Sciurotamias*) halfway between the heel and the digital pad at the base of the hallux. Tail distichous. Three pairs of mammæ.

Skull with very much the peculiar shape of that of *Sciurotamias*, being of the same long, low, subcylindrical form, which is more or less characteristic of ground-squirrels. Muzzle long. Postorbital processes not greatly developed.

Small anterior premolar completely absent, both in milk and permanent dentitions. Structure of cheek-teeth about as in *Sciurotamias*, wholly unlike that in *Menetes*.

Genotype, *Rupestes forresti*, sp. n.

This new genus is a most interesting discovery, as it is markedly different from any hitherto described. Its dental formula is at once distinctive; the structure of its teeth and the shape of the skull separate it widely from *Menetes*, and bring it nearer to the otherwise dissimilar *Sciurotamias*. Its long and rather blunt anterior claws are what one expects to find in an animal inhabiting rocky cliffs, and readily distinguish it from *Sciurotamias*, which also has much more hairy soles and is without the long intermediate sole-pad of *Rupestes*.

Mr. Forrest is to be congratulated on his discovery of so striking a new animal, and I have much pleasure in connecting his name with it.

*Rupestes forresti*, sp. n.

Size about as in *Menetes berdmorei*. General colour of upper surface dark grizzled greyish brown—the mixture rather darker than “chestnut drab”; hairs ringed with black and buffy. On each side a dull and not very conspicuous whitish line from the shoulder to the hip, similar in length and position to that found in *Menetes berdmorei*, but not so conspicuous. The dark line below the white about matching the back. Below this, again, the flanks are broadly washed with ochraceous, which passes on to the belly, where the hairs are slaty basally and ochraceous terminally. A prominent contrasted patch of wholly white hairs from chin down neck to chest. Muzzle grizzled buffy and black of a warmer tone than the back; eyelids strong buffy; cheeks, sides of head and neck, and outer base of ear deep ochraceous, without any trace of a darker cheek-line such as is found in *Sciurotamias*. Ears buffy brown, with a darker proectote. Hands grizzled buffy and brown; feet similar but darker, sometimes becoming black terminally. Tail of medium length and bushiness, distichous, the hairs ringed buffy and black, with whitish tips.

Dimensions of the type (measured by collector):—

Head and body 224 mm.; tail 166; hind foot 54; ear 27.

Skull: greatest length 60.2; zygomatic breadth 31; nasals  $19.4 \times 8$ ; interorbital breadth 14; tip to tip of post-orbital processes 19.5; height of crown from alveolus of  $m^3$  14.2; palatilar length 26; length of bulla 11.5; upper cheek-teeth 8.8.

*Hab.* as above.

*Type.* Old female. B.M. no. 22.9.1.54. Original number 27. Collected 5th June, 1921.

“Shot on scrub-clad cliffs.”—*G. F.*

This squirrel represents a genus quite distinct from any hitherto known, and forms a most interesting discovery. In general appearance the animal is like a *Menetes*, its size, dark colour, and the whitish lateral line giving it a superficial resemblance to the members of that genus.

.19. *Tamias clarkii*, Thos.

♂. 28; ♀. 29. Mekong Valley, at  $27^{\circ} 30' N.$  5000'. 11th June, 1921.

These additional specimens of this species—the finest of the

genus—are most welcome, especially as they are killed at a different season to the previous specimens, and thus help towards a knowledge of its seasonal variation.

20. *Tamiops maritimus forresti*, Thos.

♂. 132, 535, 623; ♀. 131, 536, 624. Li-kiang Range, 27° 30'. 10,000–11,000'.

Three of these specimens were killed in December, and fully bear out the suggestion made on the description of the subspecies that it would probably be without dark subdorsal stripes in the winter. We are therefore now able to trace the seasonal changes of Forrest's *Tamiops* at the principal seasons.

21. *Dremomys pernyi pernyi*, M.-Edw.

♂. 32, 83, 224; ♀. 34. Mekong–Salween divide at 28°. 7000–10,000'.

These specimens of the typical *pernyi*, agreeing as they do with those sent by the Paris Museum as representing that animal, the form fixed on as being true *pernyi* in my paper of 1916\*, are of great value, as we had hitherto scarcely any examples belonging without question to it.

In determining them and the succeeding specimens of *Dremomys* I have been able to re-examine all our western examples of *pernyi*—from Burma, Yunnan, and Sze-chwan,—and find that they may be divided into seven races, as follows:—

A. Dark-coloured, saturate, the end of the tail more or less blackened.

a. No trace of a darker median dorsal line. (E. of Salween.)

*pernyi*, M.-Edw.

b. A slight but constant indication of a dark line on the fore-back. (W. of Salween.)

a<sup>1</sup>. Size medium—skull less than 55 mm.

a<sup>2</sup>. Skull about 53 mm.; tooth-row 8.1. (Tengyueh.)

*howelli*, subsp. n.

b<sup>2</sup>. Rather smaller—skull 50 mm.; tooth-row 7.7. (Chin Hills.)

*mentosus*, subsp. n.  
*imus*, subsp. n.

b<sup>3</sup>. Size larger—skull 57 mm. (Mt. Imaw Bum.)

B. Light-coloured, grey or pale olivaceous. End of tail not blackened.

c. Size larger, skull over 50 mm.; colour greyer.

(Upper Mekong and Sze-chwan.) *griselda*, Thos.

d. Size smaller—skull about 49 mm.; colour olivaceous.

c<sup>2</sup>. Colour browner olivaceous. Fur shorter and harsher. (S. Yunnan.) ..... *flavior*, G. All.

d<sup>2</sup>. Colour more buffy olivaceous. Fur longer and softer. (N.W. Yunnan.) ..... *lichienensis*, subsp. n.

*Dremomys pernyi howelli*, subsp. n.

Colour throughout like that of true *pernyi*, or very slightly more yellowish olivaceous, but on the fore-back in every specimen there is an almost imperceptible blackish dorsal line from 1 to 2 inches in length. Under surface as in *pernyi*, the throat whitish or slightly buffy, the front aspect of the lower legs dull whitish or more or less washed with reddish. Tail as in *pernyi*.

Skull about 53 mm. in length.

Dimensions of type (measured by collector):—

Head and body 199 mm.; tail 138; hind foot 46; ear 22.

Skull: greatest length 53.5; condylo-incisive length 45.5; upper tooth-series exclusive of  $p^3$  8.1.

*Hab.* On Tai-Ping-Ho, Upper Irrawaddy, in neighbourhood of Tengyueh. Type from Ma Chang Kai, about 25 miles S.W. of Tengyueh. 6500'.

*Type.* Old male. B.M. no. 12.8.26.2. Original number 228. Collected 4th June, 1912, and presented by E. B. Howell, Esq. Nine specimens.

Slight as is the difference between this squirrel and true *pernyi*, it runs through the series of seven specimens of one and nine of the other, and the localities are quite sufficiently far apart to make a real distinction likely, so that the Tengyueh form ought evidently to have a local name.

I have much pleasure in naming this squirrel after Mr. Howell, its discoverer, to whom the National Museum owes a considerable number of Chinese mammals, including the original series of *Microtus calamorum*.

*Dremomys pernyi mentosus*, subsp. n.

Like *D. p. howelli*, but smaller and with shorter tooth-row.

General colour as in the paler and more yellowish examples of *howelli*, an almost imperceptible dark dorsal line similarly present. Details of colour as in that race. Inguinal region and front of legs washed with dull buffy.

Skull as in *howelli*, but smaller; the tooth-row rather

shorter, the measurement being quite constant in the series of *howelli*.

Dimensions of the type (measured by the collector):—

Head and body 184 mm.; tail 111; hind foot 42; ear 22.

Skull: greatest length 50·7: upper tooth-row exclusive of  $p^3$  7·7.

*Hab.* Chin Hills; type from 6 miles W. of Kindat. Alt. 5000'.

*Type.* Adult female. B.M. no. 16. 3. 26. 40. Original number 446. Collected 13th May, 1915, by J. M. D. Mackenzie, Esq.; presented by him to the Bombay Natural History Society, and given by the latter to the National Collection. One specimen.

The locality of this squirrel—west of the Chindwin—is separated by a wide area of comparatively low-lying country from that of its near ally *D. p. howelli*, and one would have expected to find more differences than the slight reduction in size, which is, however, sufficient for diagnostic purposes. All the squirrels of this group are highland dwellers, and it is therefore probable that none occur in the Chindwin-Irrawaddy area between the two forms.

The occurrence of this squirrel on the Chindwin was first recorded in 1916\*.

*Dremomys pernyi inus*, subsp. n.

Like *D. p. howelli* in all respects, but decidedly larger. Dark dorsal line just perceptible. Front of legs washed with dull buffy.

Dimensions of the type:—

Head and body (c.) 220 mm.; tail 170; hind foot 48·5; ear 25.

Skull: greatest length 57·5; condylo-incisive length 49; upper cheek-teeth exclusive of  $p^3$  8·3.

*Hab.* Mount Imaw Bum; type from the west flank; lat. 26° 10', long. 98° 30'. Alt. 7000'.

*Type.* Old male. B.M. no. 20. 8. 7. 7. Original number 19. Collected 21st October, 1919, by F. Kingdon Ward. Presented by the Bombay Natural History Society.

A large mountain race of *D. p. howelli*, which is found on the same river system further to the south.

\* J. Bomb. Soc. xxiv. p. 418.

22. *Dremomys pernyi griselda*, Thos.

♂. 107; ♀. 106. Mekong Valley, 27° 30'. 6000–8000'.

♂. 280, 281, 282, 283; ♀. 284. Mekong–Salween divide, 28° 20'. 9000–10,000'.

23. *Dremomys pernyi lichienensis*, subsp. n.

♂. 410, 539, 607; ♀. 411, 412, 486, 533. Li-kiang Range, 29° 30'. 10,000'.

♂. 625. Hills east of Li-Kiang Valley, 27°. 10,000'.

Nearly allied to *D. p. flavior* of S. Yunnan (Möng-tze), with which it agrees in size; but the general colour is a more yellowish, less brownish, olivaceous, the face is rather more buffy, and the fur is decidedly longer and less harsh. In summer specimens the fur of the back is about 14 as compared with 9 mm. in length, and in winter 15 as compared with 11 mm., and there is a marked difference in its texture. Under surface broadly washed with whitish, the throat and inguinal region more buffy; but sometimes the chest is more or less buffy.

Dimensions of the type:—

Head and body 175 mm.; tail 160; hind foot 45.

Skull: greatest length 49; condylo-incisive length 42.6; upper tooth-series exclusive of  $p^3$  7.9.

*Hab.* as above. Type from the eastern flank of the Li-kiang Range, at 27° 20' N. 10,000–12,000'.

*Type.* Adult male. B.M. no. 20. 1. 16. 2. Collected July 1918.

The winter specimens now obtained by Mr. Forrest fully confirm the difference shown by his previously-sent summer examples, as compared with the good series of typical *flavior*, both summer and winter, that was received from Orie in 1912.

24. *Marmota robusta*, M.-Edw.

♂. 398, 399, 400, 401. Mountains east of A-tun-tze, Mekong–Yangtze divide, 28° 35' N. 14,000–15,000'.

Adult and three young.

25. *Rattus andersoni*, Thos.

♂. 80; ♀. 77, 79, 85, 86. Mekong Valley, 28° N. 6000–7000'.

♂. 127. Mekong–Yangtze divide, 27° 30' N. 9000'.

The type-locality of this fine long-tailed rat is Mount Omi-san, Sze-chwan.



26. *Rattus confucianus*, M.-Edw.

♂. 76, 81, 82; ♀. 75, 87. Mekong Valley, 28° N. 7000'.

♂. 35, 113; ♀. 116. Mekong-Yangtze divide, 27° 30' N. 8000-9000'.

♂. 405, 1237. Li-kiang Range, 27° 30' N. 11,000-12,000'.

27. *Rattus eha ninus*, subsp. n.

♀. 95, 163. Mekong Valley, 28° N. 8000-9000'.

♂. 315, 317; ♀. 309, 311. Kiu-kiang-Salween divide, 28° N. 11,000'.

Duller coloured than true *eha* of Sikkim, the general tone less rufous and the face-markings almost obsolete; the black eye-rings and greyish-white whisker-patches, so well-defined in *eha*, scarcely perceptible. Sides less vivid ochraceous. Ears brown. Feet brown proximally, white distally. Tail long, thinly haired, faintly pencilled distally, brown above, whitish below, the contrast less marked than in *eha*.

Skull rather variable, but on the average like that of *eha*, with the exception that the interorbital space is narrower and more sharply ridged.

Dimensions of the type (measured in flesh):—

Head and body 127 mm.; tail 144 (imperfect, other specimens up to 180); hind foot 27; ear 20.

Skull: greatest length 32; condylo-incisive length 28·3; nasals 11·3; interorbital breadth 3·7; breadth of brain-case 13·5; zygomatic plate 2·5; palatilar length 13·2; palatal foramina 6·7; upper molar series (worn) 4·6.

*Hab.* as above. Type from the Kiu-kiang-Salween divide.

*Type.* Adult female. B.M. no. 22.9.1.107. Original number 311. Collected 19th August, 1921.

The rat obtained by Mr. Kingdon Ward on Mount Imaw Bum, and referred to *R. eha* in my list of his collection, is also a good representative example of *R. e. ninus*, which differs from true *eha* by its duller and less contrasted coloration and narrower interorbital region.

28. *Apodemus ilex*, sp. n.

♂. 176, 177, 314; ♀. 169. Kiu-kiang-Salween divide, 28° N. 8000-12,000'.

♂. 109; ♀. 39, 137. Mekong-Yangtze divide, 27° 30' N. 7000-9000'.

♂. 123, 200, 203; ♀. 31, 201, 214, 272, 334, 341. Mekong-Salween divide, 28° N. 9000-14,000'.

♂. 71, 165; ♀. 59, 73, 74. Mekong Valley, 28°. 7000'.

A brown *Apodemus* with 1-2=6 mammæ, as in *A. sylvaticus*.

Size small, form comparatively slender. Fur soft, spineless, hairs of back about 7 mm. in length. General colour above dull fulvous brown, rather more fulvous than "Saccardo's umber," lined with blackish on the dorsal area, clearer on the sides. Under surface soiled grey, the hairs slaty at base, broadly washed terminally with greyish white; line of demarcation well marked. Ears large, their proectote blackish. Hands and feet slender, white. Tail rather longer than head and body, finely ringed, almost naked, greyish brown above, white below proximally, more greyish terminally, but the upper and lower colours not sharply contrasted. Mammæ 1-2=6.

Skull comparatively broad, smoothly rounded, with scarcely any trace of supraorbital ridges. Palatal foramina not reaching to the level of  $m^1$ .

Teeth small and delicate.

Dimensions of the type:—

Head and body 97 mm.; tail 105; hind foot 22; ear 15.

Skull: greatest length 26.2; condylo-incisive length 23.3; zygomatic breadth 13.5; nasals 10; interorbital breadth 4.7; breadth of brain-case 12.3; palatal foramina 5.1; upper molar series 5.

*Hab.* as above. Type from the Salween-Mekong divide at 28° 20' N. Alt. 13,000-14,000'.

*Type.* Adult female. B.M. no. 22. 9. 1. 122. Original number 334. Collected 18th September, 1921.

So far as I am aware, no *Apodemus* with only 1-2=6 mammæ has been described from this part of Asia, that number being characteristic of the *A. sylvaticus* group, to which no doubt *A. ilex* belongs. *A. s. draco*, B.-H., has 2-2=8 mammæ, as have all the other Chinese members of the genus, with the one exception of the dark-coloured Formosan *A. semotus*, which also has 1-2=6\*.

## 29. *Apodemus speciosus latronum*, Thos.

♂. 338; ♀. 277, 278, 279, 333, 343. Mekong-Salween divide, 28° 90'. 9000'.

2-2=8 mammæ; ears large; tail fairly long.

\* Cf. Ann. & Mag. N. H. (8) i. p. 448 (1908).

30. *Apodemus chevrieri*, M.-Edw.

♀. 308. Kiu-kiang-Salween divide, 28° N. 11,000'.

♀. 406, 407, 1235. Li-kiang Range, 27° 30' N. 10,000-12,000'.

The short-tailed, short-eared *Apodemus* with 2-2=8 mammae.

The first locality mentioned above brings this type of mouse within the British area, all previous records having been Chinese.

31-37. *MICROTINÆ*.

The considerable number of voles obtained by Mr. Forrest—about 100 specimens—form the subject of a succeeding paper by Mr. Martin Hinton. They appear to belong to three genera and six species, of which several are new.

38. *Ochotona roylei chinensis*, Thos.

♂. 299, 300, 328; ♀. 325, 326, 327. Mekong-Yangtze divide, 28° 28'. 12,000-14,000'.

♀. 151, 158. Mekong Valley, 28°. 11,000-12,000'.

♀. 209. Mekong-Salween divide, 28°. 14,000'.

A provisional determination, which cannot be checked until specimens are obtained either of the Yunnan form in winter or of *Ta-chien-lu chinensis* in summer, all Mr. Forrest's specimens having been killed in the latter season, while the type is in winter fur. An indication of a fulvous mark is, however, appearing on the latter's nape, agreeing in colour with the well-developed mantle of the Yunnan series, so that I have little doubt that the determination is correct.

39. *Ochotona thibetana*, M.-Edw.

♂. 1. Sung-kwei Range, N.W. Yunnan, 26° 24' N. 10,000'.

♀. 172. Kiu-kiang-Salween divide, 28° N. 11,000'.

♂. 110, 121, 141; ♀. 111, 128. Mekong-Yangtze divide, 27° 30'. 11,000-13,000'.

♂. 161; ♀. 153. Mekong Valley, 28°. 11,000-12,000'.

♀. 198, 210. Mekong-Salween divide, 28°. 13,500-14,000'.

These specimens have smaller bullæ than the typical *thibetana*, and confirm my suggestion that the Sikkim form—*sikimaria*—will probably prove to grade into that animal.

**XLV.—Note on the Skeleton of a large Plesiosaur** (*Rhomaleosaurus thorntoni*, *sp. n.*) *from the Upper Lias of Northamptonshire.* By CHARLES W. ANDREWS, D.Sc., F.R.S. (British Museum, Natural History).

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[Plates VII.–IX.]

SOME years ago the skeleton of a very large Plesiosaur was discovered in the Upper Liassic beds of Kingsthorpe, Northamptonshire, and, although unfortunately some portions were lost before the value of the find was recognised, the remaining bones were collected by H. Gerard Thornton, Esq., of Kingsthorpe Hall, who has presented them to the British Museum. The portions of the skeleton preserved are: the anterior part of the skull and the greater part of the mandible, about 14 cervical, 3 thoracic, 24–25 dorsal, 4–5 sacral, and 17 caudal vertebræ (many of these are still united with one another), numerous portions of the ribs, and, most important of all, the nearly complete limb-girdles with the humeri and femora—the distal portions of the paddles are wanting. All the bones preserved are in very good condition, and are remarkable for their massive solidity.

*The Skull.*—Unfortunately, only the anterior portion of the skull is preserved: on the right side the lateral portions as far back as a point some distance behind the orbit are preserved, the maxilla, transpalatine, and anterior portion of the jugal being present; on the left side this portion is wanting, the maxilla being broken off obliquely some distance in front of the external nasal opening.

In a general way the skull seems to have resembled that of *Rhomaleosaurus cramptoni*, Carte and Baily\*, *sp.*, an almost complete skeleton of which was obtained from the Kettleness Alum Works (Upper Lias), near Whithy, and is now preserved in the Museum of Science and Art, Dublin. A cast of this specimen is exhibited in the Fossil Reptile Gallery of the British Museum. Certain differences between the skull of this specimen and that now described will be noted below.

The snout is broad and depressed, and the premaxillary region is strongly marked off by a broad notch, deepest at the point where the maxillo-premaxillary sutures cross

\* Journ. Roy. Dublin Society, vol. iv. p. 100 (1866).

the alveolar border. From this point these sutures run first obliquely upwards and backwards, then backwards parallel to one another, and forming the outer borders of the transversely arched and greatly elongated facial processes of the premaxillæ, which extend far back behind the external nares to the broken end of the fragment. They are divided by a median suture.

The alveolar border of the maxilla is broadly convex in its anterior portion, then beneath the point of the orbit it becomes concave, behind which it is nearly straight, extending some distance behind the orbits. The external nasal opening is about opposite the middle of the convex portion of the maxilla, and much further in front of the orbits than in *Rhomaleosaurus cramptoni*: the distance between these openings and the tip of the snout is about 81 cm.; probably the nasals and prefrontals took part in the formation of their borders, but the crushing undergone by the specimen renders this region obscure. The ventral border of the orbit is formed anteriorly by the maxilla and posteriorly by the jugal. At its hinder end the inner border of the maxilla joins a massive bone with a strong downwardly directed tuberosity; this is the transpalatine, and probably a portion of the pterygoid is united with it. Anteriorly this bone and the maxillary are separated by a notch with a rounded border, presumably the posterior edge of a suborbital vacuity.

The middle of the palatal surface of the anterior expansion of the snout is occupied by a forward extension of the vomers, which nearly reach the alveolar border, and are bounded by ridges on the premaxillæ. Behind this the vomers widen out, first joining the maxillæ and then separating the internal nares by a broad, transversely convex bar of bone: the posterior end of these openings is about opposite the hinder wall of the alveolus of the fourth maxillary tooth. Behind the nares the vomers widen out, and, no doubt, united with the anterior ends of the pterygoids: probably the palatines extended between these latter and the maxillæ, extending forwards to reach the narial openings, but the sutures are here obscure.

The first premaxillary tooth is small and close to the middle line, then come three greatly enlarged teeth, and, lastly, just in front of the maxillo-premaxillary suture a smaller one. The first tooth in the maxilla is also small, then come five very large ones, occupying the convex portion of the alveolar border: behind these there is a series of about fourteen smaller teeth, diminishing in size

from before backwards and extending some distance behind the orbit. The upper teeth seem to have had a slight anterior and posterior carina, but otherwise their crown, which is circular in section, is nearly smooth.

*The Mandible.*—Like the skull the mandible is, unfortunately, very incomplete. On the right side the ramus is preserved as far back as the end of the dentigerous portion; on the left side, while much of the middle portion of the ramus is wanting, the massive articular and angular region is preserved.

The symphysial region is greatly widened out, the expansion extending a little behind the symphysis to the socket of the sixth tooth. The splenials extend a short distance into the symphysis, the ventral surface of which is much roughened and perforated by numerous vascular foramina. Behind this expanded portion the ramus is comparatively slender. The articular region is extraordinarily massive; and has the distal portion of the quadrate still articulating with it; the angular process is broken away. The anterior expansion of the mandible bears six teeth on each side. The anterior tooth is comparatively small, and is followed by four large ones, the sixth being again small. Behind the expansion there were about twenty-five small teeth—these diminish in size towards the back of the jaw; in several cases alternate sockets are empty. The crowns of the teeth are circular in section, and their enamel surface bears numerous sharp plications running towards the top of the crown.

*Vertebral Column.*—The cervical region is represented by nine separate centra, free from the matrix and wanting the arches, and four united with one another, with the arches and zygapophyses present, but the neural spines lost: the last of these seems to be the posterior cervical, the rib-head having a slight contact with the incipient diapophysis of the neural arch. The atlas and axis are lost. The centra of the cervicals are much shorter than wide, and a little wider than high. The length of the centrum in the mid-ventral line is rather greater than at the neural canal. The nearly circular articular surface is moderately deeply concave, and its edges are rounded off. The facets for the ribs are distinctly divided into an upper and a lower portion by a ridge. The ventral surface between the rib-facets is perforated by a pair of large foramina separated by a rounded hæmal ridge.

The neural arches are massive, and the zygapophyses are very large, with nearly circular articular surfaces which

are almost horizontal; the anterior and posterior facets are about in the same plane, and the processes bearing them are separated by a well-defined rounded notch. The base of the neural arch extends the whole length of the centrum, and the neural arch is nearly circular in outline.

In the three thoracic vertebræ the rib-articulations pass upwards on to the arch; in them the zygapophysial articulations become more oval in outline, and are more inclined to the horizontal plane. Passing back along the dorsal series, which seems to have included twenty-four vertebræ in front of the sacrum, the transverse processes rise rapidly on the arch, at the same time the zygapophyses become more inclined and relatively smaller, and towards the posterior portion of the series their anterior and posterior articular surfaces become concave and convex respectively. The base of the neural arch is not so long from before backwards as in the cervical region. The transverse processes are very massive, and terminate in a thickened convex extremity, which is higher than wide and was evidently capped with cartilage in life; on the ventral surface of these processes close to their point of origin there is a deep pit. The posterior transverse processes are more inclined backwards than those in front. Towards the hinder end of the series the centra become higher than wide. In this *Plesiosaur* the sacrum (Pl. VII.) seems remarkably well developed for an aquatic animal. The sacral vertebræ are four or five in number: in them the transverse processes are very short, forming prominences borne both on the arch and centrum; these articular surfaces for the sacral ribs are large, being very considerably wider above than below—the second, third, and fourth are the largest. In this region the neural spines were short from before backwards, and the small zygapophyses make an acute angle with the vertical plane. The sacral ribs are remarkably strongly developed. The first is a simple bar of bone, with a deepened and widened proximal end for union with the vertebra: at its outer end it thins, curves slightly backwards, and articulates with the anterior process of the second sacral rib; on its anterior face towards the outer end it bears a strong cristiform ridge. The second sacral rib is the stoutest of the series: its proximal portion is compressed from before backwards, but at its outer end it widens out into a massive hammer-shaped head, the anterior arm of which unites with the first sacral rib, while the posterior arm joins the anterior limb of the similar hammer-shaped head borne by the third sacral rib, which, however, is here imperfectly preserved.

The outer face of the hammer-heads of both these ribs (2 and 3) is flattened, evidently for union of considerable closeness with the upper end of the ilium. The outer end of the fourth sacral rib is actually bifurcate, its anterior arm joining the backward process of the third, while the posterior probably joined a short stout rib, which may be regarded either as a fifth sacral or the first caudal. The articular faces of the sacral vertebræ are rather strongly concave, without the thickened and rounded border seen in the cervical centra: there seems to be no tendency for them to fuse with one another.

The caudal vertebræ have short centra with not very deeply concave articular ends, the borders of which are sharp. The facets for union with the caudal ribs are only slightly prominent in the front of the series, but become more so further back. The neural spines are short from before backwards.

The *shoulder-girdle* is chiefly remarkable for the massiveness of its constituent elements and for the shortness of the post-glenoid region of the coracoids.

The clavicular arch is, unfortunately, incomplete, but it can be seen that it consisted as usual of an interclavicle and a pair of clavicles, and that its anterior border was somewhat deeply concave; the visceral surface is slightly concave. The suture between the interclavicle and the clavicle is obscure, but probably the former was a comparatively small element confined to the front of the middle part of the arch, a portion of the suture on the right side seems to be shown on Pl. VIII. The outer end of the clavicle united with the anterior ventral prolongation of the scapula, and the suture between them is shown in Pl. VIII. The posterior border of the clavicular arch, no doubt, united with the front of the coracoids in the middle line. The scapulæ are both imperfect, the anterior ventral ramus being broken away. The glenoid ramus of the scapula is immensely massive, and unites with the coracoid in a flat triangular sutural surface; the anterior border of this region forms a sharp edge, constituting the outer border of the coraco-scapular foramen. The dorsal ramus of the scapula rises nearly vertically from the ventral and glenoid rami, its nearly flat outer face being about at right angles to the ventral face of the bone. This dorsal ramus is extraordinarily massive, being some 5 centimetres thick in the middle; its inner face is convex transversely.

The *coracoids* are chiefly remarkable for the shortness of their post-glenoid region. The glenoid region is very



massive and much thickened, the visceral surface between the articulations being strongly convex from before backwards, so that the symphyseal surface is here very deep. Anterior to this the bones are thin, and no doubt in front united with the posterior border of the clavicular arch. Towards their posterior ends also the coracoids become quite thin. The general form of the bones of the shoulder-girdle will be best understood from Pl. VIII.

The *humerus* has a long straight shaft with a broad distal expansion, chiefly on the posterior side, so that the anterior border of the bone is nearly straight. The head and tuberosity are well developed, and all the impressions for the attachment of muscles are strongly marked, so that the animal was probably adult. The bone, as a whole, is proportionately very large; it is considerably larger than the femur, while in *Rhomaleosaurus cramptoni* the reverse is said to be the case\*.

*The Pelvis* (Pl. IX.).—The *pubes* are imperfectly preserved, but enough is present on one side or the other to permit of a satisfactory restoration. Their broad blade has a strongly convex anterior border, while posteriorly it is deeply notched by the anterior border of the obturator foramen. The acetabular process for union with the ischium is very long. In the middle line the pubes united in a long symphysis, but diverged posteriorly, being probably united by cartilage with one another and with the ischia—probably they had a junction with these latter, completely enclosing the obturator foramina.

The *ischia* are very massive bones: their acetabular processes for union with the pubes are very long and sharply defined. The visceral surface of the united ischia is convex from before backwards in front and concave behind; posteriorly these bones seem to have been abruptly truncated. The obturator foramen is an elongated oval in outline, its long axis being nearly antero-posterior. The *ilia* are straight bones expanding towards their extremities; the upper expansion is considerable and is flattened, its inner face must have united with some at least of the sacral ribs, probably by a ligamentous union. As in the case of the shoulder-girdle, the pelvis is remarkable for the massive solidity of its constituent elements.

The *femur* is a nearly straight bone with a distal expansion, differing from that of the humerus in being equally

\* Lydekker, Catal. Foss. Rept. Brit. Mus. pt. ii. p. 161 (1889).

developed anteriorly and posteriorly, so that the median long axis of the bone divides it equally; it is also smaller than in the humerus. The head, trochanter, and muscle-impressions are well developed. The rest of the hind-paddle is unknown.

As already noticed, this Plesiosaur seems to resemble most nearly that of which the skeleton is described and rather badly figured by Carte and Baily\* under the name of *Plesiosaurus cramptoni*. It is very unfortunate that this fine skeleton has never been properly prepared and developed, so that the shoulder and pelvic girdles are almost completely hidden in matrix and consequently are not available for comparison with the present specimen. The general proportions of the skull and vertebral column seem to be much the same in both, but there are several differences which indicate that the two are not specifically identical. Thus in the skull of our specimen the external nasal openings are situated considerably in front of the orbits, while in *P. cramptoni* they are scarcely at all in advance of them. Again, the form of the platform of the neural arch in the cervical vertebræ, with their nearly horizontal zygapophyses, is very different from that of the cervical vertebra figured by Carte and Baily, in which the zygapophysial surfaces are strongly inclined. Furthermore, in the Northampton specimen the humerus is relatively considerably larger than in *P. cramptoni*, and its distal extremity is more expanded. It seems therefore that our specimen should be regarded as at least specifically different from *P. cramptoni*. This species was referred by Prof. H. G. Seeley† to a distinct genus, *Rhomaleosaurus*, giving, however, somewhat inadequate reasons for this. I propose to adopt the generic name *Rhomaleosaurus*, and define the genus as follows:—

Plesiosaurs with a relatively large head and short neck (the proportions being as five to eight). Cervical vertebræ with very short centra and a divided rib-facet. Well-developed sacrum. Shoulder-girdle with strongly developed clavicular arch with broadly concave anterior border; coracoids short in post-glenoid region. Pelvis with a comparatively short pubis, an elongated oval obturator foramen, and a posteriorly truncated ischium. The present species I propose to call *Rhomaleosaurus thorntoni*, sp. n., in honour of H. Gerard Thornton, Esq., who collected the remains and presented them to the British Museum.

\* *Loc. cit. supra.*

† Quart. Journ. Geol. Soc. vol. xxx. p. 448 (1874).

It seems probable that *Plesiosaurus megacephalus*, Stutchbury, should also be referred to *Rhomaleosaurus*.

Some dimensions of this specimen (R. 4833) (in millimetres) are:—

**Skull:**

Width of premaxillary expansion .....	167
"    constriction at maxillo-premaxillary suture....	133
Length (approx.) from tip of snout to external nares ....	310
Width of articular end of quadrate .....	127

**Mandible:**

Length of symphysis .....	160
Width of symphyseal expansion (exaggerated).....	208
Depth of ramus just behind symphysis .....	76

	Length.	Height.	Width.
Cervical vertebral centra, No. 1 * .....	56	91	102
"    "    "    No. 4 .....	66	99	109
"    "    "    No. 7 .....	63	99	112
First thoracic centrum .....	61	115 app.	133 app.
Second " " .....	71	123	131
Anterior dorsal " .....	66	115	144
Middle " " .....	79	156	145
Last lumbar .....	72	131	132
Largest caudal with chevrons .....	64	116	133 app.

**Shoulder-girdle:**

Width in straight line across coracoids at posterior angle of glenoid cavity .....	710
"    "    at middle of glenoid cavity .....	660
Greatest length of coracoid, so far as preserved .....	560
Height of glenoid surface of coracoid .....	127
Width of each coracoid at narrowest point behind glenoid cavity .....	257

**Scapula:**

Width of coracoidal end of scapula .....	170
"    ascending ramus of scapula .....	82
Thickness of ascending ramus of scapula .....	50

**Humerus:**

Length .....	710
Width of head .....	162
"    distal end .....	335
"    middle of shaft .....	150

**Pelvis:**

Greatest length of pubis .....	360
"    width of pubis .....	435
Length of pubic symphysis (approx.) .....	295
Length of blade of ischium .....	372
Greatest width of ischium .....	348
Length of articular end of ischium .....	194

\* These numbers do not denote the actual position in the neck, many vertebrae being missing.

Width of neck of ischium .....	125
Approximate antero-posterior length of the obturator foramen .....	168
Length of ilium .....	302
Width of upper end of ilium .....	145
"      acetabular end of ilium .....	127
Femur:	
Length .....	678
Width of upper end .....	146
"      lower end (approx.) .....	278
"      middle of shaft .....	127

## EXPLANATION OF THE PLATES.

## PLATE VII.

Sacral region of vertebral column of *Rhomaleosaurus thorntoni*, sp. n., from below. About  $\frac{1}{2}$  nat. size.

## PLATE VIII.

Shoulder-girdle of *Rhomaleosaurus thorntoni*, sp. n., from below. About  $\frac{1}{2}$  nat. size.

## PLATE IX.

Pelvic girdle of *Rhomaleosaurus thorntoni*, sp. n., from above. About  $\frac{1}{2}$  nat. size.

XLVI.—*A new Sea-star from Hong Kong.* By W. K. FISHER, Hopkins Marine Station, Pacific Grove, California.

[Plate X.]

AMONG a number of echinoderms received from Professor Arthur S. Campbell, Canton Christian College, Canton, is a new *Asterina* collected on the seaward side of Hong Kong Island.

*Asterina orthodon*, sp. n.

*Diagnosis.*—In general appearance closely resembling *Asterina nuda*, H. L. Clark\*, but differing in having the plates of the papular areas provided with numerous delicate spiculiform spinelets on the concave adcentral margin; and in the oral armature, which consists of ten to twelve slender, uniform, terete, opaque, blunt marginal spinelets, united by an

\* 'The Echinoderms of Torres Strait,' Carnegie Institution of Washington, Publication No. 214, 1921, p. 98, pl. xxiii. figs. 3 and 4.

opaque web into a continuous series of twenty to twenty-four for the two plates (median spinelets not enlarged); suboral webbed series, 7-form, of seven to nine spinelets, of which the innermost are very much the longest.  $R=15\text{ mm.}$ ,  $r=11\text{ mm.}$ ,  $R=1.36r$ ; entire diameter  $30\text{ mm.}$ ; disk rather thin, but arched radially; rays broad, rounded.

*Description.*—Abactinal surface paved with closely imbricated plates, which decrease in size, centrifugally, from anal region. Adcentral side of plates of papular area strongly concave to admit the passage of the single papula. This papular area includes the centre of disk (where the papulae, on account of size of plate, are more spaced) and a broad

Fig. 1.

Fig. 2.

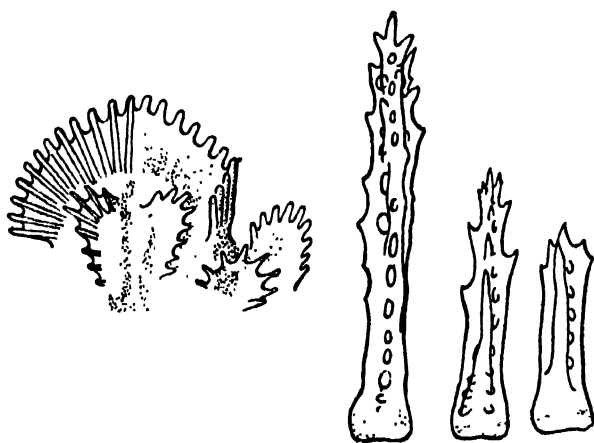


Fig. 1.—Mouth-plates and first adambulacral plate.  $\times 10$ . The spines are invisible in the dried specimen, as on the right of the figure.

Fig. 2.—Three abactinal spinelets,  $0.28$ ,  $0.17$ , and  $0.135\text{ mm.}$  long, respectively.  $\times$  about  $200$ .

petaloid area on each ray which extends to within to  $3.5\text{ mm.}$  of the ray-tip and excludes a marginal band of about the same width. At the widest part the areas include 12 longitudinal rows of plates and twelve longiseries of papulae.

The plates of two radial or carinal series are imbricated, so that the concavity faces towards the margin and adcentrally—hence away from the radial line. Those of the five longiseries on either side have the concavity facing adcentrally, but towards the radial line. This causes the two radial series to be marked off from the others. The plates of the papular area have a crescentic group of numerous very fine spicules

on the papular margin (upwards of thirty-five on the larger plates of radial region, from 0.135 to 0.28 mm. long), the remainder of plate being bare. The plates just outside the papular areas carry a spicule, or sometimes several, but a marginal band of plates (3.5 mm. wide) is entirely bare. Surface of plates dotted with tiny bead-like bosses. No small secondary plates.

The inferomarginal plates define the ambitus, and carry each a thick brush of short spicules. The superomarginals are entirely abactinal and are unarmed.

Actinal plates, in about ten chevrons, are in quite regular transverse series. They bear spaced, webbed, curved combs of four to seven slender tapered spinelets, the laterals decidedly shorter than the median, so that the margin of the comb is convex.

Furrow spinelets seven or eight, slender, terete, blunt, in a very convex comb, of which the adoral spinelet is much shorter than the aboral. The subambulacral comb, well spaced from the above, is also very convex and consists of six to eight slender tapered spinelets, the laterals being very short.

Oral spinelets, 20 to 24 to each pair of mouth-plates, are slender, opaque, terete, blunt, nearly uniform in diameter, and are webbed into a continuous series. The innermost spine of each plate (the median two of entire series) not noticeably stouter than the others. The seven to nine suboral spinelets form on each plate a 7-shaped series, of which the long axis is about parallel with median suture.

Madreporic body small, irregularly quadrate, 2 mm. from anus.

*Type-locality*.—Hong Kong (seaward side of island, low tide). Collected by Arthur S. Campbell. The type will be deposited in the U. S. National Museum.

*Remarks*.—Dr. H. L. Clark has kindly compared the holotype with that of *A. nuda*, and informs me that in his opinion the species are quite distinct though undoubtedly nearly allied. "The really obvious and important difference is in the armature of the oral plates, which is very striking when the specimens are compared. The glossy acicular spines of *nuda* give a very different facies from that of the blunt opaque spines of the Hong Kong sea-star. I think the skeletal plates in the Chinese specimen are smaller and more numerous than in *nuda*, especially the actinolaterals, but this difference may not be constant nor important. *Nuda* is much more free of spinelets abactinally than the Chinese *Asterina*. Finally, the appearance of the dry *nuda* is shiny,

as though varnished, and this I believe is due to the nature of the epidermis, and is not artificial." In *orthodon* the surface is not at all glossy when dry.

Along with this species were collected the following echinoderms:—*Astropecten vappa inæqualis*, Fisher; *Linckia lævigata* (Linn.); *Ophiothrix stelligera*, Lyman; *Ophiarachnella infernalis* (M. & T.); *Ophiactis savignyi* (M. & T.); *Polycheira rufescens* (Brandt).

#### EXPLANATION OF PLATE X.

Fig. 1. *Asterina orthodon*, abactinal aspect.  $\times 3\cdot5$ .

Fig. 2. The same, actinal surface.  $\times 3\cdot5$ .

#### XLVII.—A new Family of Hymenoptera from South Africa.

By JAMES WATERSTON, B.D., D.Sc., Assistant Keeper,  
Department of Entomology, British Museum.

[Plate XI.]

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AMONGST the large collection of Hymenoptera made by Mr. Rowland E. Turner during the past two years in South Africa, and by him generously presented to the British Museum, is a unique ♀ whose structure is so unusual that it seems necessary to create a new family for its reception. That the insect in question is parasitic seems probable, but the combination of characters which it exhibits is so remarkable as to preclude placing it in any of the presently recognised divisions of the order. Its only affinities apparently are with the Australian Megalyridæ.

#### Dinapsidæ, fam. nov.

Neuration as follows:—Fore wing, median vein (cubitus) entirely wanting; 1st transverse and basal veins coincident, i. e. the nervulus interstitial. Costa and subcosta enclosing a large cell, stigma small, cubital vein rising from the middle of the basal, well developed, but not reaching the outer margin. The following cells are present: a costal, radial, and, at least, one cubital. The subcostal and median cells are confluent. Hind wings with the neuration much reduced, only the subcosta and the basal stump of the radius being present. The subcostal cell is very narrow. Propodeon flat,

multicarinate. Abdomen attached high up on propodeon posteriorly and provided with a long ovipositor.

*DINAPSIS*, gen. nov.

♀. Head large, transverse, wider than thorax, with a crenulate collar-like carina posteriorly at junction with thorax. Eyes widely apart, surrounded by an orbital carina, the interspace, which is wider posteriorly, crenulate. From above the head is lenticular, narrowed behind the eyes, and descending evenly to shortly above the toruli where there is a strong parabolic carina which rests at either end on the corner of the mouth, completely shutting off the inflexed lower face and clypeus. Toruli near mouth-edge. Mandibles short, robust, similar, 3-dentate. Antennæ 14-jointed, labrum nearly membranous, maxillary palpus 5, labial 3-jointed. Prothorax invisible from above. Mesonotum without sutures, but with a complete longitudinal median, moderately deep punctate sulcus. Propodeon quadrate, flattened, laterally margined from just below the level of the spiracle backwards and above the insertion of the abdomen. On the depressed dorsal aspect are six longitudinal keels connected by short parallel transverse ridges. Abdomen sessile, somewhat globose from above. Last sternite in profile projecting, vomeriform, 1st segment longest, exceeding the next three taken together. Legs robust, all the femora stout. Trochanters two-jointed, 1st joint of all tarsi long, 2nd to 4th short (especially in hind pair), 5th again longer. Claws simple, a little expanded basally in hind tarsi.

Genotype, the following species.

*Dinapsis turneri*, sp. n.

♀. *A shining black species with banded antennæ, broadly bifasciate wings, and pale trochanters.*

Antennæ piceous, pedicel, apex of scape, and base of first funicular clear brown; 5-7 of funicle still paler, yellowish brown. Mandibles brown, darker basally. Trophi piceous, joints 3-5 of the maxillary palpus increasingly paler. Fore wings hyaline with two transverse brownish bands: (a) not quite reaching the costa along the transverse and basal veins, (b) complete and a little broader than the stigma and the radial cell combined. Hind wings hyaline. All veins piceous or brown. Legs, trochanters, apex of coxæ, and extreme base of femora pale. 1st and 5th tarsal joints black (hind legs) or piceous (anterior pairs), 2nd to 4th obscurely paler basally.



Head, eyes bare, widely apart (separated by  $\frac{1}{2}$  of the breadth when seen from above), ocellar triangle large, each ocellus with on its outer aspect a short shining crescentic sulcus, general surface smooth with numerous large scattered punctures.

Antennæ (Pl. XI. fig. c) : length 3 mm. (as long as the fore wing) without club, slender, all the joints cylindrical. Bulla short and globose, scape (8:5) a little expanded apically and about twice as broad as the pedicel and funicle. Pedicel and first four funicular joints widest apically, the remaining joints perfectly cylindrical. The first funicular joint is longest. The proportions more exactly are 16 (scape), 14 (pedicel), 21, 20, 18, 17, 15, 15, 14, 15, 17, 14, 14, 17. In the same scale the breadth of the funicle is about  $5\frac{1}{4}$ . Sensoria none on scape and pedicel, on the remaining joints they increase from 6-7 on the 1st funicular to 15-17 on the terminal joints.

Mandibles (9:8) with the apical teeth in a sloping row. The two lower teeth are more acute and subequal, the uppermost being shorter and blunter. Trophi partly concealed within the cup-like mouth-opening. Stipes over 20 bristles. Maxillary palpus (Pl. XI. fig. d) with joints in ratio 25:40:50:72:96, with breadth 12:25:17:15:8. Mentum compressed, vomeriform, bare. Labial palpus (fig. e) 45:50:28, breadth 18:8:12. Thorax, upper aspect, see fig. a, conspicuous on mesonotum is the A-figure formed by the meso-scutal furrow and those separating the axillæ and scutellum. Punctuation of mesonotum sparser than on head. The scutellum smooth for the most part with a few punctures chiefly at the sides. Metapleuræ with a deep broad cone-shaped hollow near upper anterior angle. In general, the bristles are rather long and coarse.

Length of body 3.5 mm.

Length, including ovipositor, 6.3 mm.

Alar expanse 7 mm.

Type, ♀, in British Museum, S. Africa, Cape Province, Ceres, Feb. 1921 (R. E. Turner Coll.).

#### EXPLANATION OF PLATE XI.

*Dinapsis turneri*, sp. n., ♀.

a. Body; cr, hind coxa.

d. Maxillary palpus.

b. Ovipositor (profile).

e. Labial palpus.

c. Antenna.

f. Fore wing.

g. Hind wing (proximal two-thirds).

XLVIII. — *Coleoptera* (Cerambycidae) from the Seychelles Islands, Aldabra, and Rodriguez \*. By CHR. AURIVILLIUS (Stockholm).

[Plates XII. & XIII.]

THE present collection, which has been entrusted to me by Dr. Hugh Scott, of the University Museum of Zoology, Cambridge, England, comes chiefly from three different localities—the Seychelles Islands, the island of Aldabra, and Rodriguez.

**Seychelles.**—The oldest list of Cerambycids from the Seychelles Islands known to me was published in 1893 by A. Lameere (Bull. Soc. Ent. Fr. 1893, p. 105–106) and contains eight species, viz. *Macrotoma wrighti*, Waterh. (1880), *Xystrocera globosa*, Ol., *Ceresium flavipes*, F. (*simplex*, Gyllenh.), *Ceresium albopubens*, Fairm. (1891), *Coptops humerosa*, Fairm. (1871), *Tragocephala alluaudi*, sp. n., *Olenecamptus bilobus*, F., and *Apomecyna sechellurum*, sp. n., all taken in 1892 by Ch. Alluaud.

Besides *Coptops humerosa*, Fairmaire also described in 1871 another Cerambycid from the Seychelles, *Hippopsis quadricollis*, not met with by Alluaud.

In his paper on insects collected by Dr. Abbott in the Seychelles (Proc. U.S. National Museum, xix. no. 1119, 1897) M. Linell enumerates only two Cerambycids, *Xystrocera globosa* and *Coptops ædificator*, F. (*biden*s, F.).

In the same year A. Théry described as new a species from La Digue, *Apomecyna fauveli* (= *Sybra geminata*, Klug, ab.), and recorded *Stromatium barbatum*, F., as a member of the fauna of the Seychelles.

Ch. Alluaud enumerates in his great catalogue ('Liste des Insectes Coléoptères de la Région Malgache,' 1900, in

\* [This paper forms part of the series of reports of the Percy Sladen Trust Expedition to the Indian Ocean under Professor J. Stanley Gardiner, F.R.S., in 1905 and 1908–9. A special set of volumes (Trans. Linn. Soc. London, ser. 2 (Zool.), xii.–xviii., from 1907 onwards) contains the majority of these reports, but several of those dealing with insects have had to be published elsewhere. I am indebted to the Editors of the 'Annals and Magazine of Natural History' for accepting the present paper, as they have already done with several others. I am responsible for the lists of localities and the biological notes in Professor Aurivillius' paper. A first set of specimens, including the *types* of all the new forms, will be placed in the British Museum; other series remain with Professor Aurivillius and in the Cambridge University Museum. —HUGH SCOTT.]

Grandidier, Hist. Nat. Madag. xxi. 1) 11 species as occurring in the Seychelles Islands, all mentioned in the foregoing papers. *Apomecyna fauveli* is, however, registered as a synonym of *Pterolophia sechellarum*.

Lastly, Kolbe, in his paper "Die Coleopterenfauna der Seychellen," 1910, enumerates 12 species, the same as those in Alluaud's list, but *Apomecyna fauveli* is regarded as a distinct species.

The present collection adds no less than 12 species to the list, and brings the total number of Cerambycids known from the Seychelles up to 23, of which 14 or 15 (=about 60 per cent.) seem to be endemic.

The endemic species are: *Macrotoma wrighti*, Waterh.; *Platygnathus sechellarum*, Auriv.; *Paradandamis fuscovittata*, Auriv.; *Micronæmia albosignata*, Auriv., *glauca*, Auriv., and *bifasciata*, Auriv.; *Ceresium albopubens*, Fairm.; *Idobrium sechellarum*, Auriv.; *Obrium nitidicollis*, Auriv.; *Anomoderus rugosicollis*, Auriv.; *Coptops humerosa*, Fairm.; *Pterolophia instabilis*, Auriv.; *Hyllisia quadricollis*, Fairm., and *Mahenes semifasciata*, Auriv. *Tragocephala alluaudi*, Lameere, which also is only known from the Seychelles, is probably only an aberration of *Tragocephala variegata*, Bertol., from the mainland of Africa, and introduced.

The non-endemic species are: *Xystrocera globosa*, Ol., also known from Madagascar, Mauritius, Egypt, South Asia, Java, Celebes, and the Philippine Islands; *Stromatium barbatum*, F., widely distributed in South Asia and also found in Madagascar, Mauritius, and Bourbon; *Ceresium flavipes*, F. (*simplex*, Gyllenh.), common from Madagascar to New Guinea and the Philippine Islands; *Coptops ædificator*, F. (Africa and S. Asia); *Tragocephala comitessa*, White (S. Africa); *Olenecamptus bilobus*, F. (occurs in S. Asia from Ceylon to New Guinea, but is not found in Madagascar or the islands adjacent to Africa); *Sybra* (= *Pterolophia*) *geminata*, Klug (Madagascar), and *Exocentrus reticulatus*, Fairm. (Madagascar, Comoros). Nearly all of these have probably been introduced in recent times by human agency.

**Aldabra.**—On the small island of Aldabra hitherto only two species of Cerambycids were known to occur, viz. *Glaucytes aldabrensis* described by Linell in 1897 from Dr. Abbott's collections (Proc. U.S. Nat. Mus. xix. no. 1119, p. 701) and *Idobrium voeltzkowi* described by Professor Kolbe in his paper "Koleopteren der Aldabra-Inseln" (Abhandl. Senckenb. Naturf. Ges. xxvi. 1902, pp. 567–586): both species are known exclusively from Aldabra. The

present collection contains five more species, viz. *Macrotoma* sp.; *Paralocus semitibialis*, Fairm. (also in Madagascar); *Idobrium femoratum*, Auriv.; *Coptops œdificator*, F. (widely distributed in the African region), and *Prosopius dentatus*, Ol. (only known from some of the small neighbouring islands and from the Mascarenes, but not from Madagascar).

The Cerambycid fauna of Aldabra comprises accordingly seven species, of which three probably are endemic and one also occurs on the mainland of Africa.

Rodriguez.—Six species of Cerambycidae were recorded from this island by C. O. Waterhouse in his report on the Coleoptera collected by the "Transit of Venus Expedition" (Phil. Trans. Roy. Soc. vol. 168 (extra vol.), pp. 510–633, pl. liii, 1879). In his above-mentioned 'Liste des Insectes Coléoptères de la Région Malgache,' Alluaud adds two more, making a total of 8 recorded from this far outlying, highly interesting island, viz. *Macrotoma simplex*, Waterh. (endemic); *Xystrocera globosa*, Ol.; *Stromatium barbatum*, F.; *Phoracantha semipunctata*, F. (Australian, undoubtedly introduced); *Ceresium flavipes*, F. (*simplex*, Gyllenh.); *Batocera rufomaculata*, De Geer (= *rubus*) (also found in Madagascar, Mauritius, and Bourbon); *Coptops œdificator*, F., and *Prosopius dentatus*, Ol.

Through the collections made by H. J. Snell and H. P. Thomasset in the year 1918\* four very remarkable species have been added to the list: *Idobrium magnum*, Auriv. (endemic); *Glaucytes interrupta*, Ol. (also known from Madagascar and Bourbon); *Madecops denticollis*, Fairm.? (? also from Mauritius and Bourbon), and *Mimecyrida fusciculata*, Auriv. (endemic).

The Cerambycid fauna of Rodriguez consists then of 12 species, of which three are highly differentiated endemic forms.

The carefulness and competence with which the members of the Percy Sladen Trust Expedition have performed the task entrusted to them is proved, not only by the many newly discovered forms, but also by the fact that they have met with all forms previously known from the Seychelles and Aldabra, with the exception only of *Macrotoma wrighti*, Waterh., and *Tragocephala alluaudi*, Lameere, of which the latter, however, was probably only accidentally introduced into the islands.

\* See H. J. Snell and W. H. T. Tams, "The Natural History of the Island of Rodriguez," Proc. Camb. Phil. Soc. xix. part 6, pp. 283–292 (1920).

I am indebted to Dr. Hugh Scott for notes on the biology of some of the species.

### Prioninæ.

#### 1. *Macrotoma (Hovatoma) simplex*, C. O. Waterh. (?).

♂. Head, pronotum, antennæ, and legs dark brown. Elytra and underside paler brown. Antennæ nearly as long as the body, first joint hardly reaching behind the eyes, about twice as long as broad, coarsely punctured; third joint quite cylindrical, 8 mm. long, as long as the two succeeding joints united, last joint acuminate, longer than the 10th joint and finely aciculate-punctate. Mandibles short, moderately punctured in basal half. Head coarsely punctured, with some short hairs in the broad furrow between the eyes and the antenniferous tubercles. Pronotum broader than long, tapering towards the apex, crenulate without spines along each side, with two posterior and one anterior impressions on the upperside and three subnitid elevations; coarsely but rather sparsely punctured in the middle, but finely and very densely punctured at the sides and at the anterior angles, nearly glabrous, with a few hairs only in the middle between the elevations; hind margin convex in the middle and densely ciliate; hind angles produced and directed obliquely backwards. Scutellum obtusely rounded, brown with blackish margin, glabrous, minutely and sparsely punctulate. Elytra glabrous, rugulose-punctate, not granulose, with three rather obsolete raised lines; the punctures much coarser in the basal fourth. Sterna, especially metasternum, hairy. Abdomen subnitid, sparsely punctate and pilose; last segment broadly emarginate at apex and densely ciliated at margin. Legs dark brown, subnitid; femora thickened at base, front and middle femora spinose beneath and sparsely granulose, hind femora nearly smooth; all the femora hairy beneath at base; tibiæ somewhat compressed and nearly triangular in section, fore tibiæ densely clothed beneath with long hairs in apical half; fore tarsi dilated, with the first joint shorter than the next two joints united, last joint not so long as joints 1-3 united. Length 41 mm.

*Loc.* Rodriguez: 1 ♂, 1918 (*Snell and Thomasset*).

The male of *M. simplex* was hitherto unknown, and I have not seen the female. It is, however, very probable that the present male belongs to the same species as the female described by C. O. Waterhouse, as this is the only species

of *Macrotoma* known from Rodriguez. Lameere refers *M. simplex* ♀ to the group of species with nearly approximated eyes ("yeux rapprochés en dessus"); in the male the eyes are, however, rather widely (2.5 mm.) distant on the upperside. The sides of the prothorax are rather strongly convex a little behind the middle.

## 2. *Macrotoma* (*Hovatoma*) sp.

*Loc.* Aldabra: Takamaka, 2 examples, x. 1908 (*Fryer*).

Both specimens are nearly destitute of legs and antennæ, and are badly damaged. They were evidently found dead, and are not fit to be described.

A narrow, nearly cylindrical, pale brown species, which seems to be identical with or nearly allied to *M. waterhousei*, Lameere. Length of the male 24 mm., of the female 30 mm.

## 3. *Platynathus* (?) *sechellarum*, sp. n. (Text-fig. 1.)

♀. Head, thorax, antennæ, and legs blackish; elytra dark brown, blackish at the base; abdomen dark brown, paler at the sides. Head and pronotum punctured in the middle and finely granulose at the sides, clothed with short yellowish hairs emitted from the punctures or from the granules. Head flattened between the eyes, slightly concave between the antenniferous tubercles; genæ rather long. First antennal joint obconical, hardly reaching beyond the middle of the eye; second joint half as long as the first joint or a little longer (the following joints are missing). Pronotum broad, nearly as broad as the elytra at the base, broadest between the posterior lateral angles; apical angles obtuse, anterior lateral angles small; sides slightly concave between the lateral angles, posterior lateral angles broad and produced; hind angles rather acute; sides between them and the posterior lateral angles distinctly emarginate. Scutellum obtusely rounded with few shallow punctures. Elytra punctured all over, with very minute yellowish setæ in the punctures; the punctures slightly coarser at the base; no granules; a short sutural spine at apex; the raised lines very obsolete. Underside and legs with setiferous punctures; abdomen with smaller and more crowded punctures. Length 39 mm. (abdomen swollen and protruding behind the elytra).

*Loc.* Seychelles: Frigate Island, 1 ♀, 1905 (*Gardiner*).

This interesting species differs from the only hitherto

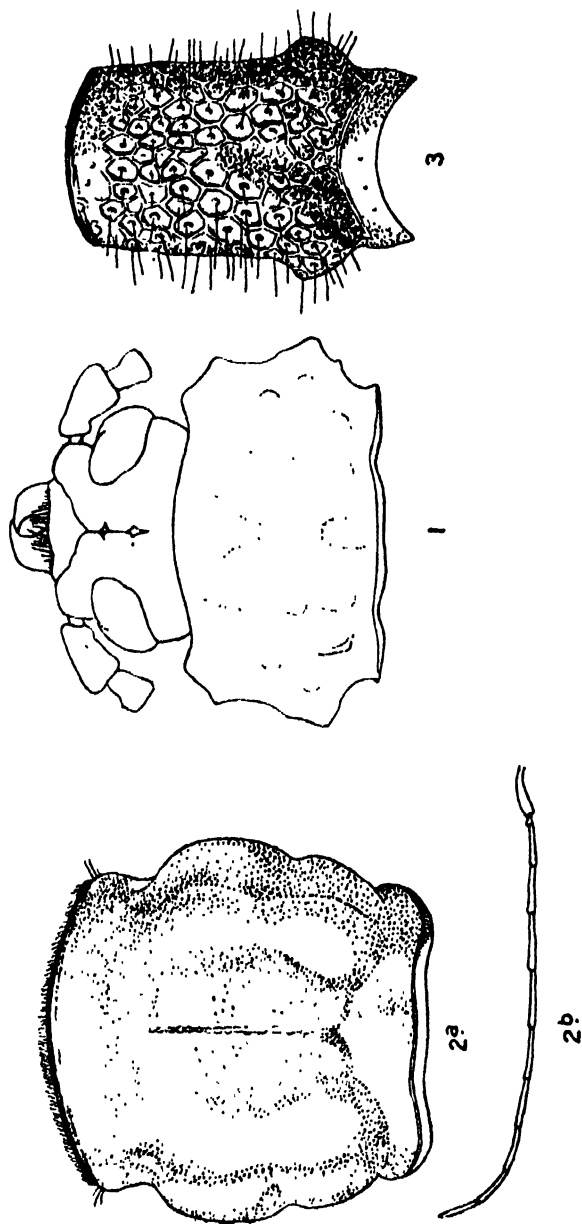


Fig. 1.—*Platygasterus schellorum*, sp. n., head and prothorax,  $\times 4$  (the specimen is asymmetrical, having an extra tubercle on the posterior part of the right-hand lateral margin, as is shown in the figure).  
 Fig. 2.—*Idobriam magnus*, sp. n.: a, prothorax,  $\times 20$ ; b, antenna,  $\times 4$ .  
 Fig. 3.—*Anomoderus rugosicollis*, sp. n.: prothorax,  $\times 50$ .

known species of the genus by the form of the pronotum and the somewhat shorter second joint of the antennæ. Its generic position is somewhat doubtful, as the male is unknown.

PARADANDAMIS, gen. nov.

*Front* subvertical, with a slightly curved transverse line immediately below the antennal supports; genæ extremely short. *Eyes* large and convex, coarsely faceted and strongly emarginate; the lower lobes large and nearly touching the base of the mandibles. *Antennæ* inserted near the base of the mandibles, nearly as long as the body in the male; second to fifth or sixth joints ciliated below; the first joint obconic and slightly curved, not reaching the hind margin of the eyes; the third joint elongate, but hardly reaching the base of the elytra, and much shorter than the fourth and fifth united; joints 6-10 slightly angulate at the apex; eleventh joint acuminate, hardly longer than the tenth; joints 3-11 finely carinate on the front edge, pubescent and minutely punctulate; the first and second joints subnitid and rather strongly punctate. *Prothorax* transverse, not broader than the head with the eyes, bisinuate at base, with the hind angles somewhat produced; the lateral edges very fine between the hind angles and the coxal cavities, thence completely wanting; no punctured side area. *Scutellum* as long as broad, subtriangular. *Elytra* long, subcylindrical, rounded and unarmed at the apex; each with three obtuse, somewhat waved costæ; epipleural fold as in the genus *Dandamis*, strongly widened at base. *Legs* slender; femora slightly compressed, sublinear; first joint of the hind tarsi shorter than the next two united. *Last ventral segment* of the male nearly truncate at the apex.

This interesting genus seems to be most nearly allied to *Dandamis*, Gah., from which it, however, differs by the structure of the antennæ and the prothorax. The episterna of the metathorax are more restricted behind on the outer side than on the inner, and are obliquely acuminate at the apex.

*Paradandamis* is another of the forms which connect Lacordaire's *Ægosominæ* and *Monodesminæ*, and it proves the near relation of these groups, newly acknowledged also by Lameere (Bull. Mus. Paris, xxi. 1915, p. 61). It may be noted here that *Prionus reticulatus*, Dalm., has nothing at all to do with *Anacanthus costatus*, Serv., but is a female of a species of *Megopis*, sens. lat., unknown to me.



4. *Paradandamis fuscovittata*, sp. n. (Pl. XIII. fig. 4.)

♂. Pale brown; head, prothorax, and tibiæ darker brown, elytra testaceous-brown, each with two longitudinal darker stripes on the outer costæ; head and prothorax rather closely and coarsely punctured, above nearly naked, only with very short hairs; eyes equally distant above and below, the distance somewhat narrower than the scutellum; prothorax with a very obtuse angle near the middle of each side, the disc with two nearly obsolete transverse elevations; scutellum dark brown, subtriangular, hairy at apex; elytra closely and very coarsely punctured, subnitid with short erect hairs rising from the punctures; body beneath, and legs, more densely hairy. Length 17 mm.

*Loc.* Seychelles: Mahé, 1908-9, 1 ♂, without further record of locality.

**Cerambycinæ.***Microntæmia*, gen. nov. (Disteniinorum).

*Eyes* prominent, rather finely faceted, broadly distant above and below, feebly emarginate. *Head* slightly exserted and briefly narrowed behind the eyes. *Maxillary palpi* long, with the last joint fusiform and pointed or obliquely truncate and triangular. *Antennæ* longer than the body by one-fourth to one-third of their length; first joint curved, gradually thickened towards the apex; third joint slightly longer than the first and the fourth; the following joints gradually shorter. *Prothorax* unarmed, more or less rounded at the sides and broadest at the middle, truncate at apex and at base, convex above, without tubercles or rugosities. *Scutellum* rather narrow, truncate at apex. *Elytra* somewhat flattened above at the base, gradually tapering towards the apex, which is slightly acuminate; marked above, except near the apex, with rows of punctures. *Prosternal process* very narrow, but reaching as far behind as the coxæ; metasternal process rather broad, sloping anteriorly. Front and middle *coxæ* globular; acetabula of front coxæ broadly open behind, of middle coxæ slightly open on the outer side. *Legs* elongate; femora pedunculate and gradually but slightly thickened towards apex, hind femora reaching to or behind the apex of the elytra; tibiæ very long and narrow, straight and cylindrical, middle tibiæ with a slight notch on the outer side near the apex. The first joint of the hind tarsi is as long as or longer than the second and third united.

The present genus differs from most of the other genera belonging to the Disteniini by having the prothorax short, regularly convex, and unarmed. From the genus *Eupalelius*, Fairm., which also has an unarmed prothorax, it seems to differ by the much shorter prothorax, the longer antennæ, and the shorter basal joint of the hind tarsi.

The majority of specimens of the first two species of this genus were bred from larvæ found in fallen and rotting sticks of endemic trees, principally *Northea*, in the highest forests. The records given below show that the greater number of these larvæ were collected in Silhouette in the drier months of August and September, but some were also obtained in Mahé in December.

5. *Micronæmia albosignata*, sp. n. (Pl. XII. fig. 1.)

Body black, with some markings of greyish-white pubescence; the face before the antennæ, the femora, and joints 3-7 of the antennæ, except at apex, brown or brownish; the first and the four last joints of the antennæ as well as the tibiæ and tarsi more or less darkened, fuscous. Sides of the meso- and metasternum, hind margin of pronotum (rather broadly), two transverse bands on the elytra (one before and one behind the middle), the suture between the bands, an oblique stripe between the bands emitted from the suture, and the apical fifth of the elytra, densely clothed with white or greyish pubescence. Length 7-9 mm.

Pronotum transverse with the sides strongly rounded. The elytral rows of punctures are somewhat irregular at the base and cease at the posterior white band or a little behind it; the subhumeral and humeral rows are very distinct and regular, the latter forming a distinct edge. The white markings of the elytra are sometimes indistinct or almost wanting (by abrasion?).

*Loc.* Seychelles: Silhouette, Mahé.

"Of the 11 examples 8 were bred from larvæ or pupæ, six of which were found in the high forests of Silhouette in August or September, and two in the high forests of Mahé in December, at various places between 1000 and 2400 feet. One specimen bears a record of having been bred from a fallen stick of the endemic 'Capucin' (*Northea*) tree from the highest peak of Silhouette, and, as far as I can remember, most or all of the larvæ were found in fallen and rotting sticks or quite small branches of dicotyledonous trees, possibly *Northea* in every case. Compare the records given under the following sp., *M. glauca*, and its ab. *humeralis*.

All the bred examples of *M. albosignata* and *M. glauca* were reared by a method which I had seen practised in England by Dr. Sharp. It consists in packing a screw-topped glass bottle of small diameter tightly with fragments of the wood, and placing a single larva in each bottle in a crevice between the pieces, after which the zinc top is screwed on and the bottle is left undisturbed, sometimes for weeks.

"The 3 specimens taken in an adult state were found respectively in the high forest of Morne Pilot (Mahé), xi. 1908; in Silhouette at about 1000 feet, viii.-ix. 1908; and in Mahé by Gardiner in 1905."—H. S.

#### 6. *Micronæmia glauca*, sp. n.

Testaceous-brown; vertex, pronotum, and elytra blackish, rather densely clothed with a glaucous or greyish-green pubescence, and without markings; abdomen subnitid, black; antennæ, except the underside of the first joint, tibiæ, and tarsi sometimes more or less infuscated; the pubescence at the base and sides of the pronotum, on the scutellum and at the sides of the breast, often glistening white; last joint of palpi triangular; first antennal joint always testaceous below, following joints either testaceous-brown with black tips, or entirely fuscous; pronotum minutely punctulate, with nearly glabrous median line; elytra flattened in basal part, with six rows of punctures, the fourth row being the shortest; femora testaceous; tips of tibiæ and tarsi more or less fuscous. Length 6-8 mm.

*Loc.* Seychelles: Silhouette, Mahé.

"8 examples, 5 of which were bred from larvæ, or in one case from a pupa, found in the high damp forests. Two larvæ and the pupa were found in Silhouette in August or September, and one larva was found in the high forest of Morne Seychellois (Mahé) in December. One of the Silhouette larvæ was found in a stick of 'Capucin' (*Northea*) on the highest peak, about 2400 feet. For methods of breeding see under *M. albosignata*.

"The 3 specimens taken as adults were found respectively at over 1000 feet in Silhouette, viii. 1908; high damp forest at summit of Morne Pilot, Mahé, over 2000 feet, xi. 1908; and in Mahé, 1905 (*Gardiner*)."—H. S.

#### *M. glauca*, ab. *humeralis*, ab. nov.

Differs from the typical form by being smaller and having on the elytra a lateral subhumeral yellow stripe,

which often emits a short transverse yellow band towards the suture behind the shoulders. Scutellum yellowish. Legs and antennæ often darkened. Length 5-6 mm.

*Loc.* Seychelles: Silhouette, Mahé.

"11 specimens, 7 of which were bred. Four were reared from fallen sticks of 'Capucin' (*Northea*) found on the highest peak of Silhouette, about 2400 feet, viii.-ix. 1908; one from a larva found in 'Capucin' wood at about 1500 feet (Silhouette); one from a fallen stick of a dicotyledonous tree (not named) found just above Mare aux Cochons in Silhouette, over 1000 feet; and the remaining one from another larva found near Mare aux Cochons.

"The 4 examples taken as adults are all from the highest and dampest forest at the summits of Morne Pilot or Morne Blanc (Mahé), at end of October or in November 1908."  
—H. S.

7. *Micronaemia bifasciata*, sp. n. (Pl. XII. fig. 2.)

Black, with a sericeous pubescence; antennæ, palpi, legs, breast, shoulders, and two transverse lateral spots on each elytron, one before and one behind middle, testaceous or brown; antennal joints 8-7 and 10 black at tip, 8 and 9 entirely pale, 11 entirely black. Pronotum distinctly narrower at base than at apex, with the sides rounded in middle, longer than in the foregoing species, minutely transversely punctate-striate, the sculpture almost concealed by the yellowish adpressed pubescence, the hairs of which are directed upwards towards the median line. Tarsi fuscous, pale at base. Punctures of elytral rows coarse and reaching behind the middle. Length 5 mm.

*Loc.* Seychelles: Mahé, 1 specimen from the Mare aux Cochons district, about 1500 feet, 26. i.-2. ii. 1909; it was taken in a forest of the endemic "Bois de Fer" (*Vateria Seychellarum*), these trees being some of the largest and oldest in the forests of Mahé.

Easily distinguished by the form of the pronotum and the markings of the elytra.

8. *Xystrocera globosa*, Oliv.

*Loc.* Seychelles: Mahé; Port Victoria and other places in the cultivated country, 1905, 1906, 1908-9; one specimen is labelled "grub in sap of [the imported] 'Bois Noir,' *Albizia Lebbek*" (Gardiner, 1905). Rodriguez, 1918 (Snell and Thomasset). 33 examples in all.

All the specimens belong to the Asiatic *X. globosa* and not to the African *X. vittata*, F. See my paper on the Cerambycidae of Kilimandjaro, p. 142 (1908) \*.

9. *Stromatium barbatum*, Fabr.

*Loc.* Seychelles: Mahé; cultivated country, Port Victoria, &c., 1905 and 1908-9, 7 examples.

10. *Puralocus semitibialis*, Fairm.

♀ = *Teinotus cinereus*, Branca.

*Loc.* Aldabra. Two examples, both taken at light, 1908-9 (*Fryer*). Named by Dr. Gahan, and agreeing with Fairmaire's description: I have not been able to compare them with specimens from Madagascar.

11. *Ceresium albopubens*, Fairm.

*Loc.* Seychelles: Mahe, xi. 1908, 1 specimen.

12. *Ceresium flavipes*, Fabr.

*Loc.* Seychelles, 16 specimens: Silhouette, Mahé. Silhouette: Mare aux Cochons plateau, over 1000 feet, ix. 1908. Mahé: near Morne Blanc, about 1000 feet; Cascade, about 1000 feet; Baie Lazare, &c. Rodriguez: 3 examples, 1918 (*Snell and Thomasset*).

13. *Idobrium voeltzkowi*, Kolbe.

*Loc.* Aldabra: 2 specimens (*Fryer* coll.), one from Takamaka, xi. 1908, the other bearing only the record "comes to light."

Kolbe referred the genus *Idobrium* to the Graciliinæ, but the characters he gives ("Acetabula coxarum anticarum et intermediarum clausa") are those of the Obriinæ. Kolbe had only a single male before him; at least one of the specimens before me is a female, and it has the abdomen formed as in the Obriinæ, proving that the genus belongs to that group.

14. *Idobrium femoratum*, sp. n.

Pale testaceous, head and prothorax somewhat darker; densely clothed with a fine greyish pubescence; apical club

\* In Y. Sjöstedt's 'Kilimandjaro-Meru Expedition,' vol. i. Abteilung 7, no. 11 (pp. 139-152).

of hind femora dark fuscous; antennæ without erect hairs, somewhat longer than the body, with the third joint hardly longer than the fourth; prothorax much longer than broad, cylindrical, not narrowed at base, slightly constricted behind the apex, above with five obtuse elevations and slightly tumid at each side in the middle, narrower than the head with the eyes; elytra parallel-sided or slightly widened posteriorly, broadly rounded at apex, each somewhat pointed at the suture, distinctly punctate from the base to three-fourths of their length, the punctures above arranged in 6-7 regular rows without distinct hairs, apical fourth nearly impunctate; hind femora reaching a little beyond the apex of the elytra; hind tibiæ with some few short hairs. Length of body 7-8 mm.

*Loc.* Aldabra: Takamaka, xi. 1908, 2 specimens (*Fryer*).

15. *Idobrium magnum*, sp. n. (Text-figs. 2 a, 2 b.)

Unicolorous, brownish-testaceous with a very fine greyish pubescence, rather dull and without erect hairs; eyes distant above and below; head impunctate above; prothorax not longer than broad in the middle, slightly narrower at base than at apex, constricted behind apex and with a transverse basal furrow curved in the middle, above with an obtuse longitudinal callosity on each side of the disc and with the lateral margin obtusely rounded in the middle, the disc with shallow, rather obsolete punctures; scutellum rounded at the apex; elytra parallel-sided to near apex, each sharply rounded or subacuminate at the apex, finely and irregularly punctured from the base almost to the apex, the punctures rather crowded and not stronger at base, a fine elevated line from near the base behind the humerus to near the apex; extreme apex subnitid, without punctures; hind femora not reaching the apex of the elytra, tibiæ with some few erect hairs. Length 13 mm., breadth 3 mm.

*Loc.* Rodriguez: viii.-xi. 1918, a single female (*Snell and Thomasset*).

The third joint of the antennæ is hardly as long as the fourth.

16. *Idobrium sechellarum*, sp. n. (Pl. XII. fig. 3.)

Brownish or testaceous; front and vertex of the head, pronotum, a broad lateral stripe and a median spot connected with the lateral stripe on the elytra, infuscated, dark brown or blackish, the club of the hind femora and the apical

joints of the antennæ also often darkened ; body above with short erect hairs ; joints 2-6 of the antennæ distinctly ciliated below ; body with a very fine greyish pubescence ; eyes broadly distant ; head, with the eyes, broader than the prothorax, impunctate, with a short fine furrow between the antennæ ; the antennæ longer than the body in both sexes, their first joint obconic, slightly curved, the third joint as long as the fourth, but shorter than the first and the fifth ; prothorax longer than broad, much more narrowed at base than at apex, obtusely protuberant on each side a little before the middle (more so in the female than in the male), its upper side depressed, nearly flat, with the usual elevations nearly obsolete ; scutellum small, narrow ; elytra parallel-sided, somewhat dehiscent and separately rounded at apex, punctured from base to or somewhat beyond the middle, the punctures arranged in longitudinal rows, the apical half nearly impunctate ; the dark lateral stripe is more or less dilated at the base and behind, and is connected in the middle with a discal spot, which does not always reach the suture ; epipleural margin sometimes, and extreme apex always, pale ; legs testaceous, hind femora not reaching the apex of the elytra. Length 5-6.5 mm.

*Loc.* Seychelles, Mahé : Mare aux Cochons district, 1500 feet, 26. i.-2. ii. 1909, 7 ♂, 8 ♀, beaten from trees of endemic "Bois de fer" (*Vateria Seychellarum*)\*.

This species is somewhat variable in colour and the antennæ of the male often have joints 5-11 dark fuscous ; rarely the club of the hind femora is also darkened.

In all the species of *Idobrium* the suture of the elytra is longitudinally impressed at the base behind the scutellum, forming a longer or shorter groove, which is best developed in *Idobrium magnum*.

#### KEY TO THE SPECIES OF *IDOBRIUM*.

- A. The punctures of the elytra not arranged in longitudinal rows.
  - a. Prothorax not longer than broad, slightly constricted at base. Length 13 mm. . . . . 1. *I. magnum*.
  - b. Prothorax longer than broad, strongly narrowed at the base. Length about 6 mm. . . . . 2. *I. voeltzkowi*.
- B. The punctures of the elytra arranged in longitudinal rows from base to middle or somewhat beyond middle.
  - a. Prothorax strongly constricted at base, sub-

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\* See also under *Obrium nitidicolle* and *Micronæmia bifasciata*.

cordiform, dilated in the middle and nearly flat above. Elytra marked with a fuscous lateral stripe. Body above with erect hairs.

Antennæ ciliated beneath ..... 3. *I. seychellarum*.

- b. Prothorax much longer than broad, quite cylindrical, not narrowed at base. Body without erect hairs above. Antennæ not ciliated.....

4. *I. femoratum*.

### 17. *Obrium nitidicolle*, sp. n. (Pl. XIII. fig. 7.)

Yellowish-testaceous, a broad stripe on each side of the prothorax and five spots (one sutural before middle, one humeral, and one discal behind middle) on the elytra fuscous-brown; the elytral spots often more or less obsolete; head sloped in front, subnitid, the clypeus limited above by a rather deep, straight groove; antennæ longer than the body in both sexes, finely pubescent without erect hairs, third and fourth joints shortly ciliated below, first joint clavate, third joint a little longer than the fourth, joints 5-8 equally long, each longer than the third, joints 9-11 gradually slightly diminishing in length; prothorax very elongate, more than twice as long as broad at the base, nearly cylindrical, a little narrower at base than at apex, with the sides slightly convex in the middle between the transverse grooves, apical groove obsolete above, basal groove narrow, curved above in the middle; the whole pronotum shining, naked, impunctate, and smooth without elevations; elytra parallel-sided, rounded at the apex, naked, shining, distinctly punctate from base to middle or a little beyond the middle, the punctures arranged in rows or nearly so; femora subnitid, naked, gradually and slightly clavate, hind femora not reaching the apex of the elytra; tibiæ with very short erect hairs; first joint of hind tarsi as long as the second and third united. Length 5-6 mm.

Since the front coxæ are exerted and the last joint of the palpi subcylindrical, I have referred this small species to *Obrium*. The longitudinal grooves of the episterna of the metathorax are, however, wanting or concealed by the lateral margins of the elytra.

*Loc.* Seychelles: Silhouette, Mahé. Silhouette: Mare aux Cochons plateau or forest near by, over 1000 feet, ix. 1908, 1 ♂, 1 ♀. Mahé: near Morne Blanc, about 1000 feet, xi. 1908, 8 ♂, 2 ♀; Mare aux Cochons district, about 1500 feet, i.-ii. 1909, 1 ♂ from forest of "Bois de Fer" (*Vateria Seychellarum*).



18. *Anomoderus rugosicollis*, sp. n. (Text-fig. 3.)

Small, fuscous-brown; head and pronotum blackish; elytra brownish; legs shining, castaneous; wings translucent, whitish; head small, rugoso-punctate, the front vertical, transverse; antennæ much shorter than the body, reaching a little beyond the apex of the elytra, subnitid, first joint short, obovate; fourth joint a little shorter than the others, joints 3-8 slightly thickened at the apex; prothorax elongate, subcylindrical, strongly constricted at base and distinctly swollen or obtusely tuberculate on each side just before the basal constriction, nearly three times as long as broad at the base; except in the basal constriction closely set with very small depressed (and in the middle foveate) warts, from each of which arises an erect hair; elytra abbreviated, rounded at apex, irregularly punctate with erect hairs in the punctures; abdomen parallel-sided, rounded at the apex, as long as the wings; legs short, hind femora not reaching the apex of the abdomen; femora abruptly clavate with a slender peduncle and an elliptical club; first joint of hind tarsus as long as the second and third united. Length 4 mm.

*Loc.* Seychelles. Malé: 1 specimen, swept from low herbage of ferns &c. close to the house at Cascade Estate, about 800 feet, 1909.

This little species agrees with *Anomoderus* in having divided eyes, short antennæ, and elongate prothorax, but differs from the hitherto known species of the genus, both of which are from Madagascar, by the form and sculpture of the prothorax.

19. *Glaucytes interrupta*, Ol.

*Loc.* Rodriguez (*Snell and Thomasset*), 1918, 1 ♀.

20. *Glaucytes aldabrensis*, Linell.

*G. aldabrensis* is probably a local race of *G. lineatocollis*, Fairm., and seems only to differ by having the tip of the elytra unarmed and their lateral margins without a rufous stripe.

*Loc.* Aldabra: 3 ♂, 3 ♀, "only found in the flowers of one species of tree (name not recorded), xii. 1908" (*Fryer*).

**Lamiinae.**

**21. *Coptops humerosa*, Fairm.**

*Loc.* Seychelles: Silhouette, Mahé. Silhouette: near coast (one specimen) and Mare aux Cochons plateau, over 1000 feet (several specimens). Mahé: various places (not the high forests), 1905 and 1908-9. 13 examples in all.

**22. *Coptops edificator*, Fabr.**

This widely distributed species is variable in colour and markings. The specimens from Assumption are uniformly grey with few and indistinct markings. The specimens from Rodriguez are, on the contrary, very distinctly and richly marked. Two specimens from Aldabra are much smaller than the others.

*Loc.* Assumption: 1909, 6 specimens labelled "very common on *Ficus*-trees" (*R. P. Dupont*); 1910, 1 example. Aldabra: 1907, 1 specimen (*d'Emmerez*); Takamaka, xi. 1908 and Esprit I., xii. 1908 (*Fryer*). Coetivy: 1905, 1 specimen. Chagos: Salomon and Diego Garcia atolls, 1905, several specimens. Rodriguez: 1918, 8 examples (*Snell and Thomasset*). 27 specimens in all.

**23. *Tragocephala comitessa*, White.**

*Loc.* Seychelles: Mahé, 1 ♀, 1914 (*Thomasset*).

Agrees closely with specimens from South Africa, and is undoubtedly introduced.

**24. *Olenecamptus bilobus*, Fabr.**

*Loc.* Seychelles: 16 specimens from Silhouette and Mahé. All the examples from Silhouette, 10 in number, were beaten at once from a single tree (of an introduced species) in the yard behind Mons. Dauban's house at La Passe, viii. 1908. Some of the Mahé specimens were collected in 1905 and 1906.

This beetle is at times a pest of cultivated figs in India, and references to it occur in the literature of economic entomology. It has recently been reared from larvæ found under the bark of a fallen *Ficus glomerata*, and notes and figures illustrating its life-history are contained in the Report of the Imperial Entomologist (*Sci. Reports Agric. Res. Inst. Pusa*, 1920-21, Calcutta, 1921, pp. 41-59, 6 plates).

25. *Madecops* (?) *denticollis*, Fairm. (?).

Loc. Rodriguez: 1918, 3 specimens (*Snell and Thomasset*).

Without a comparison with specimens from Bourbon, I am unable to say whether the form from Rodriguez is the same as Fairmaire's *denticollis* or is a nearly allied species. Fairmaire's description agrees, as far as it goes, rather well with the present specimens, except that the first joint of the antennæ is obconic rather than "crasse clavatus," that the prothorax is more transverse, not transversely wrinkled behind ("postice leviter plicatulo"), and that the elytra are rounded at the apex. The specimens are very like *Saperda vulpina*, Klug, which is said by Alluaud to resemble *Madecops denticollis*.

If *M. denticollis* really belongs to *Madecops*, then that genus has nothing at all to do with the Mesosini, but is most nearly allied to the Niphonini, from which it only differs by having the head considerably distant from the anterior coxæ. The eyes are emarginate, but not subdivided.

## MIMECYRIDA, gen. nov. (Velorinorum).

*Head* short, not retractile; front transverse, broadly concave between the antennary tubercles; genæ short. *Eyes* deeply emarginate, but not subdivided, coarsely faceted; their lower lobe subquadrate. *Antennæ* somewhat longer than the body, broadly distant at base, setaceous; first joint obconic, slightly flattened on under-side; third joint much longer than the first and also longer than the fourth, slightly curved; the following joints gradually decreasing in length. *Prothorax* short, transverse, distinctly and rather broadly constricted at base; sides unarmed, but slightly convex in the middle; apical groove obsolete, strongly arcuate above; a very small tubercle on each side at the apical margin; basal and apical margins truncate. *Scutellum* subquadrate with the apex truncate. *Elytra* subcylindrical, nearly parallel-sided; each rounded at apex with the sutural angle distinct; scutellar region somewhat elevated, posterior half with longitudinal costæ, humeral costa distinct from base. *Legs* rather short; femora thickened towards apex with a fine longitudinal line on each side, hind femora not reaching the apex of the abdomen; tibiæ rather long, cylindrical, intermediate tibiæ entire; first tarsal joint shorter than the second and third united; claws divaricate. *Acetabula*

of middle *coxæ* not open to the epimera; front *coxæ* slightly angulate exteriorly, their acetabula completely closed posteriorly. The *intercoxal process* of the prosternum and of the mesosternum rather narrow, slightly curved.

The species for which I have erected this new genus has entirely the habit of a smaller *Hecyrida*, but differs from that group by the exteriorly closed acetabula of the middle *coxæ* and the non-retractile head.

26. *Mimecyrida fasciculata*, sp. n. (Pl. XIII. fig. 6.)

Fuscous, densely clothed with a whitish tomentum and variegated with blackish spots and stripes; head with impressed median line and two fuscous spots between the antennæ; antennæ pubescent and set with very short pallid setæ, but not ciliate beneath, the first joint nearly reaching the middle of the prothorax; joints 3-6 variegated with small dark spots or rings, joints 7-11 blackish with pale basal ring; pronotum with broad dark median stripe and a small dark dot on each side of it, punctate, but the punctures hardly visible except in the median stripe; elytra very slightly emarginate, nearly truncate at base with the humeri distinct but rounded, lateral margin and humeral carina slightly waved, especially behind the middle, and clothed with short hairs on the wave-ridges; posterior half with 4-5 irregular discal costæ, not reaching the apex or obsolete before apex, two or three of these costæ furnished with small tufts of yellowish hairs; scutellar region variegated with fuscous, a broad lateral stripe from the base below the humerus to the middle, not visible from above except at its posterior end, a double row of small black sutural dots, and a large black subapical transverse spot behind the discal costæ, not reaching the sides; legs variegated with dark dots. Length 10 mm.

*Loc.* Rodriguez: 1918, 1 specimen (*Snell and Thomasset*).

The specimen is undoubtedly a female, the last ventral segment being long, as long as the third and fourth segments united, and furnished with a fine longitudinal groove; its apex is slightly emarginate in the middle.

27. *Pterolophia instabilis*, sp. n. (Pl. XIII. fig. 8.)

A true *Pterolophia* with the middle tibiæ entire, the first antennal joint flattened below, reaching nearly to the middle of the prothorax, and the eyes subdivided and distant above. Very variable in size, colour, and markings. There

are four or five, at first sight very different, forms, which are, however, connected by intergrades. Head greyish with or without brown speckles. Lower lobe of the eyes small, subquadrate, hardly as long as the gena. Antennæ about as long as the body, more or less distinctly annulate with pale yellow at base and apex of joints 3-10, and speckled with brown or fuscous. Prothorax transverse, truncate at base and apex, evenly convex above and finely punctured, with the sides arcuate, greyish or brownish without distinct markings. Scutellum always black or fuscous with narrow pale margins. Elytra rather short, truncate at base, and broader than the thorax, subcylindrical to beyond middle, thence narrowed and strongly sloping to the apex, each with the apex rounded and unarmed, somewhat flattened above from base to middle and very slightly swollen at the base on each side of the scutellum, and with a nearly obsolete discal costa in the middle; rather strongly punctate, the punctures nearly arranged in rows, stronger and deeper on the sides of the disc, some of the punctures being distinctly larger than others. According to colour and markings of the elytra the following varieties may be distinguished:—

- a. The *typical form* (Pl. XIII. fig. 8).—Ground-colour dark greyish-brown, a broad yellowish-white stripe from the shoulders to the suture, forming then a broad sutural band, which is widened posteriorly to an irregular pale patch at the beginning of the posterior declivity. The ground-colour consequently occupies the scutellar region, the whole sides (being much broader in the middle), and the apex of the elytra.
- b. Ab. *suturalis*, nov.—Elytra above from base to the posterior declivity with a very broad greyish-white sutural band, somewhat narrowed at the middle. Differs from the typical form by having the ground-colour of the sides produced to the shoulders, but not occupying the scutellar region.
- c. Ab. *abscissa*, nov.—The dark colour of the sides of the elytra more or less strongly widened above, often reaching the suture a little behind the middle and separating the anterior part of the pale sutural band from the posterior patch, which is nearly always extended over the whole declivity to the apex.
- d. Ab. *minuscule*, nov.—Differs from the typical form only by having the whole apical declivity as pale as the sutural band. Only a very small specimen, length 4 mm.

- e. *Ab. transversa*, nov.—Elytra greyish or dark brown, without other markings than a more or less distinct transverse whitish or greyish irregular fascia at the beginning of the posterior declivity.
- f. *Ab. unicolor*, nov.—Elytra unicolorous greyish or brown without markings, or only with 1–2 white dots on the declivity of each elytron.
- g. *Ab. nigrovittata*, nov.—Elytra pale yellowish-grey, each having on the side of the disc two nearly denuded blackish vittæ, of which the upper one is very short, and both are abbreviated towards the apex. Intermediate between *ab. suturalis* and *ab. unicolor*.  
Length 4–7 mm.

*Loc.* Seychelles: Silhouette, Mahé, Long, and Anonyme Islands.

89 specimens in all. The forms *abscissa* (7 specimens), *transversa* (10 specimens), and *unicolor* (9 specimens) seem to be commoner than the others. About 20 examples, representing 5 forms, were taken in Long Island, a small coconut-planted islet with a few patches of native vegetation, close to Mahé, in July 1908. In Silhouette and Mahé this species was found at elevations of 1000 feet or more, in the endemic forests, but not in the highest and dampest zones of forest.

## 28. *Prosopius dentatus*, Oliv.

*Loc.* Amirantes: Eagle I., 1905, 2 examples (*Gardiner*). Astove: 1907, 1 specimen (*Thomasset*). Aldabra: 1907, 1 specimen (*d'Emmerez*). Also known from Mauritius, Bourbon, and Rodriguez.

## 29. *Sybra geminata*, Klug.

*Loc.* Seychelles: Silhouette, Mahé. 35 specimens, from various places in the endemic forests at elevations between 1000 and 2000 feet: the only exception is a single specimen labelled as from St. Anne (a small cultivated islet near Mahé), 1905 (*Gardiner*).

A true *Sybra*, as Gahan has pointed out. Very variable in size, colour, and markings. "*Apomecyna*" *sechellarum*, Lameere, and *A. fauveli*, Théry, are undoubtedly only forms of *Sybra geminata*, Klug. "*Oopsis*" *biangulata* and *O. ephippiatu*, Fairm., and *Praonetha dorsata*, Fairm., are probably also forms of this species. The size of the specimens before me varies from 6 to 10 mm.

30. *Hyllisia quadricollis*, Fairm.

*Loc.* Seychelles: Mahé, near Morne Blanc and Cascade Estate, 6 specimens.

Fairmaire described this species as an *Hippopsis*. The species of *Hippopsis* have, however, the head and eyes differently shaped, and seem to be restricted to the American fauna.

*H. quadricollis* agrees well with the genus *Hyllisia*, and seems nearly allied to *H. vittata*, Fähr., which by its short hind femora and the truncate apex differs from the type of *Hyllisia* (*stenideoides*, Pasc.). The antennæ are (as in typical *Hyllisia*) 12-jointed, and the first joint reaches the base of the prothorax. The antennal joints 1-5 are ciliated beneath with the ciliæ of joints 3-5 very long in the male; lower lobe of the eye elongate, much longer than broad, and nearly thrice as long as the gena; front strongly punctured and more so in the male than in the female.

31. *Exocentrus reticulatus*, Fairm.

*Loc.* Seychelles: Long I, vii. 1908, 1 example; Anonyme I., i. 1909, 3 specimens; these localities are two small coconut-planted islets near Mahé.

Known from Madagascar and the Comoro Islands, but not previously recorded from the Seychelles. Fairmaire erected in 1901 for this and three other species from Madagascar a new genus *Pseudocentrus*, which, however, seems not to be sufficiently distinct from *Exocentrus*.

## MAHENES, gen. nov. (Acanthocinorum).

*Head* a little broader than the prothorax at apex. Front transverse, somewhat depressed in the middle. *Eyes* coarsely faceted, emarginate; lower lobe subquadrate, twice as long as the gena. *Antennary tubercles* broadly separate and strongly divergent. *Antennæ* nearly twice as long as the body, 11-jointed, ciliated beneath to apex, but without hairs above; first joint obconic, rather short, not or hardly reaching the middle of the prothorax, much shorter than the third joint; third and fourth joints nearly equal; the following joints much shorter. *Prothorax* subquadrate with a small tubercle on each side behind the middle; the sides slightly arcuate; the base hardly narrower than the apex. *Scutellum* short and broad, rounded

at apex. *Elytra* cylindrical, with fine and short erect setæ; each rounded at apex and with three fine elevated lines, two on the disc and one at the margin (humeral). *Legs* short; femora moderately thickened; first joint of hind tarsi shorter than the second and third united.

This new genus seems to agree in many of its characters with *Enes*, Pasc., but differs especially in the elongate third joint of its antennæ.

32. *Mahenes semifasciata*, sp. n. (Pl. XIII. fig. 5.)

Testaceous-brown, clothed with a rather dense, pale greyish tomentum and ornamented with dark brown markings; head unicolorous; antennæ fuscous at tip and with the first joint also darkened at apex; prothorax finely punctured, with the sides and two broad discal longitudinal bands fuscous-brown; elytra finely and irregularly punctured (the punctures showing a tendency to an arrangement in rows), pale greyish with the humeral callus, a slightly elevated spot on each side of the scutellum, a broad oblique fascia in the middle of each side, not reaching the suture, and some irregular, often obsolete, subapical and sutural spots, blackish or brown and nearly denudate; a patch on the femora, the apical half of the tibiæ and the tarsi also more or less fuscous. Length 4–6 mm.

*Loc.* Seychelles: Silhouette, Mahé, Long I. Silhouette: Mare aux Cochons or forest above, over 1000 feet, ix. 1908, 2 examples. Mahé: near Morne Blanc, about 1000 feet, xi. 1908, 1 specimen, and Cascade Estate, about 1000 feet, i. 1909, 1 specimen. Long I., vii. 1908, 1 example.

EXPLANATION OF THE PLATES.

PLATE XII.

- Fig. 1. *Micronœmia albosignata*, gen. et sp. n. (Seychelles), × 10.  
 Fig. 2. *Micronœmia bifasciata*, sp. n. (Seychelles), × 10.  
 Fig. 3. *Idobrium sechellarum*, sp. n. (Seychelles), × 10 (a rather dark example).

PLATE XIII.

- Fig. 4. *Paradandamia fuscovittata*, gen. et sp. n. (Seychelles), × 4.  
 Fig. 5. *Mahenes semifasciata*, gen. et sp. n. (Seychelles), × 8.  
 Fig. 6. *Mimecyrida fasciculata*, gen. et sp. n. (Rodriguez), × 6.  
 Fig. 7. *Obrium nitidicolle*, sp. n. (Seychelles), × 8.  
 Fig. 8. *Pterolophia instabilis*, sp. n., typical form (Seychelles), × 10.



XLIX.—*The Spider Liphistius: a Study in the Biology of a Primitive Animal.* By T. H. SAVORY, B.A.

A PRIMITIVE animal is of interest either because it represents a "missing link" or because it is a present reminder of a bygone age. The structure of a primitive animal differs from that of its nearest contemporaries in a number of features which for various reasons are considered to be of a more primitive character, and hence it furnishes living evidence of the course that evolution has taken in the group to which it belongs. Moreover, the material providing the evidence is usually obtainable freshly and in quantity, and it can be dissected, and these properties are not shared by the fossilized remains on which much of the geological record is based. Hence the emphasis granted to the descriptions of the anatomy of such familiar primitive animals as *Amphioxus*, *Peripatus*, *Petromyzon*, and even Ray Lankester's hypothetical Arche-mollusc. The five weeks' journey of Dr. Wilson, Bowers and Cherry-Garrard in the Antarctic winter of 1911—a journey which was probably the most strenuous of its kind—from Cape Evans to Cape Crozier, was made for the purpose of securing embryos of the Emperor Penguin, which is said to be the nearest living approach to a primitive bird.

In considering the biological significance of a primitive animal, two dangers are at hand. The first of these is the rather too general conception of evolution as a ladder-like ascent of types, or an "end-on" process in which the more specialized examples of one group ultimately gave birth to the less specialized examples of the next. It must be remembered that the truth is rather to be found in the idea that the generalized examples of a group have produced, on the one hand, the specialized examples of that group, and, on the other, the primitive members of the next higher group.

The second difficulty is to distinguish between the primitive and the specialized characters of the individual animal. Rarely can an animal exist for geological ages without showing a specialization in one way or another, which, as it were, compensates for its simplicity elsewhere. It is, of course, a matter of environment and competition, but it is necessary to recollect that an animal is seldom primitive lock, stock and barrel.

A primitive animal which has been described by a few authors, but which has seldom, if ever, been treated with the fulness it deserves from the broadly biological point of view, is the spider *Liphistius*. A single species was described as

*Liphistius desultor* by Schiödte in 1849 from a mutilated specimen, and perfect examples were described by the Rev. O. Pickard-Cambridge and by van Hasselt. Thorell, of Upsala, later pointed out that Pickard-Cambridge and van Hasselt had described specimens which were different species of the same genus, while in the Supplement to the 'Histoire Naturelle des Araignées' Eugène Simon removed the specimen which he had in his first volume described as *Liphistius desultor* into a second genus, which he called *Anadiastothele*. There are therefore these four species at present known, constituting the family Liphistioidæ:—

- Liphistius desultor*, Schiödte (= *L. mamillatus*, Cambr.).  
 — *sumatranus*, Thorell (= *L. desultor*, v. Hass.).  
 — *birmanicus*, Thorell.  
*Anadiastothele thorelli*, Simon.

This elaboration of the original species into several species closely related (and the distinction between these four types is very slight) is precisely what has occurred in the histories of both *Amphioxus* and *Peripatus*, and does not in the least influence their general significance. Indeed, this separation is of value in emphasizing the fact, already referred to, that a primitive animal is not necessarily without elaborations of its own.

In the present state of our knowledge the internal morphology of *Liphistius* provides no evidence for its primitive nature. On the one hand, anatomists who dissect spiders are exceedingly scarce, on the other hand, *Liphistius* is a comparatively rare species with a limited distribution, so that it is not surprising that the two have as yet failed to meet. Still less have we a chance of researches upon its embryological development, which alone can solve several questions with any degree of certainty; and at present we are therefore confined to its externals.

The external features in which *Liphistius* shows its primitive nature most plainly are:—

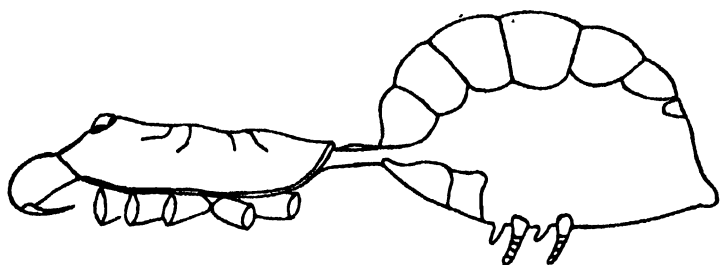
1. The position of its spinnerettes.
2. The segmentation of its abdomen.
3. The grouping of its eyes.
4. The shape of its sternum.
5. The lengths of its legs.

The spinnerettes of all other spiders are situated, as is well known, at the extreme posterior end of the abdomen, grouped more or less closely round the anal tubercle. In *Liphistius*

the spinnerettes are placed in the middle of the lower surface, a place which is obviously more closely allied to the normal position of the abdominal appendages of the Arthropoda. All other spiders have six, or fewer, spinnerettes, while *Liphistius* alone has eight. The significance of these facts needs no emphasis.

The segmentation of the abdomen is equally striking. This part of the body is protected by a series of nine dorsal plates of a leathery consistency, a fact which points to a relationship between the Araneæ and the Pedipalpi and Scorpions. Simon suggests that these plates may not represent segmentation, but that they may result from the division of a dorsal shield, such as is found in the Oonopidæ and the Tetramblemma. This is one of the points which it is hard to solve

Fig. 1.



Profile.

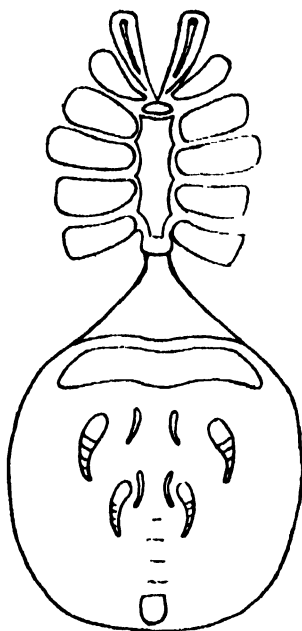
in the absence of embryological knowledge; analogy is apt to prove misleading, but the following arguments in favour of their primitive nature may be cited:—

1. The fossilized spider, *Protolycosa*, of the Carboniferous strata possesses a similar series of dorsal plates.
2. Some species of the genus *Paratropis*, one of the more generalized Theraphosæ, show vestiges of nine segments in the abdomen of the adult.
3. Since the abdomen of such spiders as have been embryologically studied passes through a segmented stage it is reasonable to suppose that the segmented form is primitive, and on this account the dorsal shield of *Oonopides* is simply to be regarded as having, like the rest of the abdomen, lost its metamerism.

Ventrally the first and second segments of the abdomen are provided with plates, which cover the apertures of the reproductive system and of the two pairs of lung-books. The possession of two pairs of lung-books and no spiracular tracheæ is also a primitive feature, shared by *Liphistius* and the Theraphosæ.

The shape of the abdomen of *Liphistius* is almost spherical, and this is certainly not a primitive form. In all living

Fig. 2.



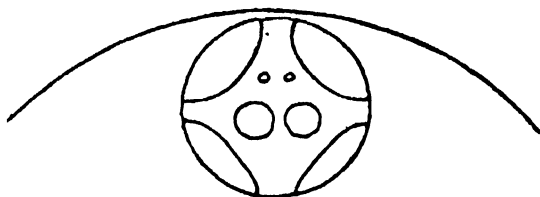
Ventral surface.

spiders of generalized type the prevailing form of abdomen is elongate or cylindrical, while the spherical form is characteristic of the Epeiridæ, makers of the elaborate spiral webs, and the Linyphiidæ, famous for the bewildering complexity of their genera, distinguishable only by minutiae of structure. Abdominal sphericity may be due to decrease in length or to a development of the diverticula of the intestine, and in either case it is a character in which *Liphistius* shows a specialization of its own and a departure from the primitive type.

The grouping of spiders' eyes is a very valuable feature in taxonomy. The course of evolution seems, roughly speaking, to indicate a general wandering of the eyes away from their close proximity around and upon an ocular tubercle, so that they spread over a larger area of the cephalothorax. The retention and elaboration of the ocular tubercle in the Linyphiidæ is a secondary specialization, and the reduction of the number of eyes to six, four, two, or none in the suborder Tubitellariæ would seem to be a degenerate rather than a primitive condition. The eyes of *Liphistius*, eight in number, are all situated upon a small pinnacle, and are considered to represent their primitive condition, probably with justification.

The sternum of *Liphistius* is long and narrow. This is an unusual form in living spiders, found only in a few six-eyed forms, in which the elongation is not so marked. The significance, if any, of this feature in *Liphistius* is obscure,

Fig. 3.



Ocular tubercle and eyes.

unless it be assumed that an elongated form is more closely allied to a series of segments than is a shorter form.

In the relative lengths of its legs, *Liphistius* is very unusual. The fourth pair is the longest, then the second, then the third, and the first pair is the shortest. In this respect, as in the segmental abdomen, *Liphistius* resembles *Protolycosa*, in which the length is  $4.2 = 3.1$ , and, in fact, all authors agree in placing *Protolycosa*, as an extinct genus, among the Liphistioidæ.

There seems to be no description extant of the male palpus of *Liphistius*. This is particularly unfortunate, since it is an organ which, more than any other, shows variations of form in different genera of spiders, and a knowledge of its structure in this instance would assuredly be of the greatest interest.

In addition to anatomical features, we can assert the primitive nature of *Liphistius* on geological and geographical

evidence. Reference has already been made to the very striking resemblance between *Liphistius* and *Protolycosa*, in respect of the lengths of the legs and the segmented abdomen; and this is a point which scarcely needs emphasizing. We find, in effect, one single small family of living spiders closely similar to the type of the Carboniferous strata—a type from which every other family has widely departed.

These spiders have been reported only from Penang and Sumatra, and, since their unusual form would attract the attention of any naturalist, we may confidently assume that they occur nowhere else. This fact is in itself surprising, and suggests that in the West Indies alone in the habitable world *Liphistius* has found an environment in which it could persist unchanged for geological ages. It is in accordance with this fact to find that Sumatran fauna is entirely different from that of Java, across the narrow Straits of Sunda; for example, it includes a peculiar species of elephant, which is not found in Java, while a great ape—*Siamanga melalophus*—is peculiar to this island.

We may therefore conclude that the Liphistioidæ are a family of spiders which, while showing very definite resemblances to several of the Theraphosæ, are in most ways a survival of an extremely primitive type; and we tender a claim that, when completely studied, they will hold among primitive animals an important position.

I. — *A Revision of the Genera of the Family Liparidæ.* By Colonel C. SWINHOE, M.A., F.L.S., F.Z.S., F.E.S., Member of the Entomological Society of France and of the Bombay Natural History Society.

#### Family Liparidæ.

This family has been much neglected by entomologists; Lord Rothschild's excellent paper in Nov. Zool. (xxiv. p. 350, 1917) shows that a revision of the family is very much needed.

Sir George Hampson in his 'Moths of India' sinks Liparidæ to Lymantriidæ, because *Liparis* was erected by Artedi for a genus of fishes in 1738, but by the rules of nomenclature the International Commission decided that 1758, the date of the tenth edition of Linnæus's 'Systema

Naturæ,' should be fixed as the nomenclatorial starting-point.

The types of *Liparis*, Ochseneimer, and "*Lymantria*," Hübner, are the same ("*Monacha* of Linnæus"), and as the former has precedence the family must stand as Liparidæ.

Strand, in Seitz's Macrolep. ii. (1917), calls the family Liparidæ, but ignores the genus *Liparis* and uses the name *Lymantria*.

The genus *Anthela*—distinguished by the very peculiar structure of the areole in the fore wing, which is broad and extends nearly to the apex of the wing, and the wide separation of vein 8 in the hind wing from the cell—Turner makes a subfamily of the Liparidæ in the first of his very important papers on the Australian species of the family. But in his last paper in Proc. Linn. Soc. N. S. Wales, May 1921, he makes the Anthelidæ a separate family; but as its relation to the Liparidæ is very evident I prefer leaving it as a subfamily of the Liparidæ.

Lord Rothschild points out that many generic names in this family are wrongly placed, and I have considered it necessary to prove this, to give the types of each generic name with its proper reference in its proper place.

I have sunk many so-called genera under *Nygmia* and other genera: most of them are identical in structure with the type-genera; some of them vary in unimportant points, which I consider cannot be called generic.

All the species in which Kirby is quoted, except those mentioned as being in the B.M. or Mus. Oxon., represent forms unknown to me.

#### Subfamily ANTHELINÆ.

The Anthelinæ are almost entirely Australian, most of them have been described by Walker from types in the British Museum and the Oxford Museum. Dr. Turner has sunk many of them, having had before him larger series than we possess in England; according to Dr. Turner, the variability of many of the species is very great, certainly the type-specimens of many of the species sunk are so different from each other as to justify their description as separate species.

Genus *PTEROLOCERA*, Walker, iv. p. 883 (1855).

#### 1. *Pterolocera amplicornis*.

*Pterolocera amplicornis*, Walker, iv. p. 884.

*Pterolocera similis*, Walker, l. c.

*Pterolocera insignis*, Herr.-Schäff. Lep. Exot. 1858, p. 458.

Types, ♂, Adelaide, in B.M.; Melbourne.

Genus *APROSITA*, Turner, Trans. Roy. Soc.  
S. Australia, 1914, p. 456.

2. *Aprosita obscura*.

*Trichiura obscura*, Walker, vi. p. 1481 (1856).

*Diaphona nuna*, Felder, Reise Nov. pl. xcix. fig. 14 (1868).

*Aprosita urothrix*, Turner, l. c. p. 457.

*Aprosita obscura*, Turner, Proc. Linn. Soc. N.S.W. xlv. p. 167 (1921).

Type, N. Australia, in B.M.; Queensland, N. S. Wales,  
S. Australia.

Genus *NATAXA*, Walker, v. p. 1179 (1855).

*Dicreagra*, Felder, Reise Nov. pl. C. fig. 2 (1868).

3. *Nataxa flavescens*.

*Arna* (?) *flavescens*, Walker, v. p. 1128.

*Nataxa flavescens*, Walker, v. p. 1179.

*Nataxa rubida*, Walker, xxxii. p. 512 (1865).

*Dicreagra ochrocephala*, Felder, l. c.

Type, Tasmania, type *rubida* Australia, both in B.M.; type  
*ochrocephala*, Sydney, in Coll. Rothschild, Adelaide, King  
George's Sound, N. S. Wales.

Genus *ANTHELA*, Walker, iv. p. 853 (1855).

*Darala*, Walker, iv. p. 856.

*Cohussa*, Walker, xxi. p. 288 (1860).

*Neumania*, Swinhoe, Cat. Het. Mus. Oxon. i. p. 199 (1892).

*Pseudodreanta*, Bethune-Baker, Nov. Zool. xi. p. 371 (1904).

*Cycethra*, Bethune-Baker, l. c.

Type, *ferruginea*, Walker, *Darala acuta*, Walker.

4. *Anthela ferruginosa*.

*Anthela ferruginosa*, Walker, iv. p. 854.

*Darala parva*, Walker, iv. p. 892.

*Darala minuta*, Swinhoe, Cat. Het. Mus. Oxon. i. p. 210 (1892).

Type, ♀ (nec ♂), Brisbane; type, *parva*, Tasmania, in  
B.M.; type, *minuta*, N. S. Wales, in Mus. Oxon.

5. *Anthela phœnicias*.

*Anthela phœnicias*, ♂, Turner, Trans. Roy. Soc. S. Australia, 1902,  
p. 182.

*Anthela aspilota*, ♀, Turner, l. c.

Types, Queensland, in Coll. Turner.



6. *Anthela rubicunda*.

*Darala rubicunda*, Swinhoe, Ann. & Mag. Nat. Hist. (7) ix. p. 419 (1902).

*Darala pudica*, Swinhoe, l. c.

Types, ♂♂, Roebourne, N.W. Australia, in B.M.; S. Australia, Bungaree.

7. *Anthela adriana*.

*Darala adriana*, Swinhoe, l. c.

Type, ♂, Sherlock River, in B.M.; Herberton, N. Queensland.

8. *Anthela leucocera*.

*Anthela leucocera*, Turner, Proc. Linn. Soc. N. S. Wales, 1921, p. 170.

Type, ♂, Hornsby, near Sydney, in Coll. Lyell.

9. *Anthela clementi*.

*Darala clementi*, Swinhoe, Ann. & Mag. Nat. Hist. (7) ix. p. 81 (1902).

Type, ♀, Sherlock River, in B.M.

10. *Anthela elizabetha*.

*Odonestis elizabetha*, White, Gray's Journ. Lep. Australia, ii. p. 478 (1841).

*Darala rubescens*, Walker, xxxii. p. 370 (1865).

King George's Sound: type, *rubescens*, ♂, Australia, in B.M.; Albany, W. Australia.

11. *Anthela linoepepla*.

*Anthela linoepepla*, Turner, Proc. Linn. Soc. N. S. Wales, 1921, p. 171.

Type, ♀, Darwin, N. Australia, in Coll. Turner.

12. *Anthela neurospasta*.

*Anthela neurospasta*, Turner, Trans. Roy. Soc. S. Australia, 1902, p. 182.

*Anthela ochroneura*, Turner, Proc. Roy. Soc. Queensland, 1915, p. 25.

Types, ♂♂, Stapleton, N. Australia; Wyndham, N.W. Australia, in Coll. Turner.

13. *Anthela hyperythra*.

*Anthela hyperythra*, Turner, Proc. Linn. Soc. N. S. Wales, 1921, p. 172.

Types, ♂♀, Darwin, N. Australia, in Coll. Turner.

14. *Anthela achromata*.

*Anthela achromata*, Turner, Trans. Ent. Soc. 1904, p. 480.

Type, Thursday Isl., in Coll. Turner; Cairns, Standway Hills, Mount Garnet, Mt. Molloy, N. Queensland, Darwin, Stapleton, W. Australia.

15. *Anthela habroptila*.

*Anthela habroptila*, Turner, Proc. Linn. Soc. N. S. Wales, 1921, p. 173.

Type, ♂, Kalgoorlie, W. Australia, in National Museum, Melbourne.

16. *Anthela unisigna*.

*Anthela unisigna*, Swinhoe, Trans. Ent. Soc. 1903, p. 447.

Type, ♂, Sherlock River, N.W. Australia, in B.M.

17. *Anthela guenei*.

*Teara guenei*, Newman, Trans. Ent. Soc. 1856, p. 284, pl. xviii. fig. 9.

*Neumania guenei*, Swinhoe, Cat. Het. Mus. Oxon. i. p. 199 (fig.) (1892).

Toowomba, Queensland, Sydney, N. S. Wales.

18. *Anthela denticulata*.

*Teara denticulata*, Newman, Trans. Ent. Soc. 1856, p. 283.

*Darala undulata*, Felder, Reise Nov. pl. xcvi. fig. 11 (1868).

*Darala basigera*, Walker, xxxii. p. 372 (1863).

Adelaide, type, *basigera*, in B.M.; type, *undulata*, Melbourne, in Coll. Rothschild.

19. *Anthela ekeikei*.

*Colussa ekeikei*, Bethune-Baker, Nov. Zool. xi. p. 429, pl. fig. 42 (1904).

Type, N. Guinea, in Coll. Bethune-Baker.

20. *Anthela strigata*.

*Pseudodreata strigata*, Bethune-Baker, l. c. p. 371.

Type, N. Guinea, in Coll. Bethune-Baker.

21. *Anthela arva*.

*Cycethra arva*, Bethune-Baker, l. c. p. 393.

Type, N. Guinea, in Coll. Bethune-Baker.

Ann. & Mag. N. Hist. Ser. 9. Vol. x.

22. *Anthela inconstans*.

*Colussa strigata inconstans*, Joicey, Noakes & Talbot, Trans. Ent. Soc. 1915, p. 380, pl. lxii. figs. 2 ♂, 3 ♀.

Types, ♂ ♀, Arfak Mts., Dutch N. Guinea, in Coll. Joicey.

23. *Anthela angiana*.

*Colussa angiana*, Joicey, Noakes & Talbot, *l. c.* fig. 4.

Type, Dutch N. Guinea, in Coll. Joicey.

24. *Anthela odontogrammata*.

*Colussa odontogrammata*, Joicey & Talbot, Ann. & Mag. Nat. Hist. (8) xx. p. 56, pl. iii. fig. 14 (1917).

Type, ♂, Dutch N. Guinea, in Coll. Joicey.

25. *Anthela ostræa*.

*Anthela ostræa*, Swinhoe, Trans. Ent. Soc. 1903, p. 442.

*Anthela chrysocrossa*, Turner, Proc. Roy. Soc. Queensland, 1915, p. 24.

Type, ♂, Adelaide River, N. Australia, in B.M.; type, ♂, *chrysocrossa*, Batchelor, Adelaide River, in Coll. Turner. Nearest to *denticulata*, Newman.

26. *Anthela oressarcha*.

*Anthela oressarcha*, Turner, Proc. Linn. Soc. N. S. Wales, 1921, p. 177.

Types, ♂ ♀, Koseinsko, N. S. Wales, in Coll. Turner.

27. *Anthela cnecias*.

*Anthela cnecias*, Turner, *l. c.* p. 178.

*Darala ocellata*, var., Walker, iv. p. 887 (1855).

Type, ♀, Tasmania, in B.M.

28. *Anthela ocellata*.

*Darala ocellata*, Walker, iv. p. 887.

*Ommatophora tetrophthalmia*, Herr.-Schäff. Ausser. Schmett. 1856, figs. 506, 507.

*Darala ochroptera*, Lower, Trans. Roy. Soc. N. Australia, xvi. p. 14 (1892).

*Anthela symphona*, Turner, Trans. Ent. Soc. 1904, p. 480.

*Colussa psammochroa*, Lower, *l. c.* p. 112 (1908).

*Anthela nigristigma*, Fawcett, P. Z. S. 1917, p. 248.

Type, Tasmania, in B.M.; type, *symphona*, Tasmania, in Coll. Turner; Queensland, Sydney, Victoria, S. Australia.

29. *Anthela ariprepes*.

*Anthela ariprepes*, Turner, Proc. Linn. Soc. N. S. Wales, 1921, p. 179.

Type, Lake Hattah, Victoria, in Coll. Turner.

30. *Anthela magnifica*.

*Darala magnifica*, Lucas, Proc. Linn. Soc. N. S. Wales, 1891, p. 286.

*Darala xantharcha*, Meyrick, Trans. Roy. Soc. S. Australia, 1891, p. 191.

*Anthela tritonea*, Swinhoe, Trans. Ent. Soc. 1903, p. 448.

Type, Queensland, in Coll. Lucas; type, *xantharcha*, Daringa, in S. Australian Museum; type, *tritonea*, Queensland, in B.M.

31. *Anthela tetraphrica*.

*Anthela tetraphrica*, Turner, Proc. Linn. Soc. N. S. Wales, 1921, p. 181.

Type, ♂, Beverley, in S. Australian Mus.; type, ♀, Northam, West Australia, in Coll. Turner.

32. *Anthela allocota*.

*Anthela allocota*, Turner, l. c. p. 182.

Type, ♀, Melbourne, in National Museum, Melbourne.

33. *Anthela asciscens*.

*Darala asciscens*, Lucas, Proc. Linn. Soc. N. S. Wales, 1891, p. 288.

Type, Queensland, in Coll. Lucas.

34. *Anthela callixantha*.

*Darala callixantha*, ♂, Lucas, Trans. Roy. Soc. S. Australia, 1902, p. 214.

*Anthela flavata*, ♀, Swinhoe, Trans. Ent. Soc. 1902, p. 452.

Type, ♂, Hammersley Range, in S. Australian Museum; type, ♀, *flavata*, Sherlock River, N.W. Australia, in B.M.; Carnarvon, W. Australia.

35. *Anthela phæodesma*.

*Anthela phæodesma*, Turner, Proc. Linn. Soc. N. S. Wales, 1921, p. 183.

Type, ♂, Kuranda, near Cairns, in Coll. Turner.

36. *Anthela pyrrhica*.

*Anthela pyrrhica*, Turner, l. c.

Type, ♀, Koseinsko, N. S. Wales, in coll. Turner.

37. *Anthela canescens*.

*Darala canescens*, Walker, iv. p. 901 (1855).

*Darala inornata*, Walker, *l. c.*

*Dreata deficiens*, Walker, xxxii. p. 374 (1865).

*Darala complens*, Swinhoe, Cat. Het. Mus. Oxon. i. p. 209 (1892).

*Anthela carneotincta*, Swinhoe, Trans. Ent. Soc. 1903, p. 451.

*Anthela crenulata*, Swinhoe, *l. c.*

*Anthela epicrypha*, Swinhoe, Ann. & Mag. Nat. Hist. (7) xvi. p. 150 (1905).

Type, ♂, Australia; type, *deficiens*, ♂, Australia, in B.M.; type, *complens*, Australia, in Mus. Oxon.; types, ♂ ♀, *carneotincta*, Fremantle, in B.M.; type, *crenulata*, also Fremantle, in B.M.; type, ♀, *epicrypha*, N. S. Wales, in B.M.

38. *Anthela asterias*.

*Darala asterias*, Meyrick, Trans. Roy. Soc. S. Australia, 1891, p. 192.

*Darala uniformis*, Swinhoe, Cat. Het. Mus. Oxon. i. p. 210 (1892).

*Anthela niphomacula*, Lower, Trans. Roy. Soc. S. Australia, 1905, p. 175.

*Anthela callispila*, Lower, *l. c.*

Type, ♂, Melbourne, in Coll. Meyrick; Lower's types, Broken Hill, S. Australia, in Coll. Lower.

39. *Anthela figlina*.

*Darala figlina*, Swinhoe, Ann. & Mag. Nat. Hist. (7) ix. p. 81 (1902).

Type, ♂, Sherlock River, N.W. Australia, in B.M.

40. *Anthela stygiana*.

*Darala stygiana*, Butler, Ann. & Mag. Nat. Hist. (5) ix. p. 88 (1882).

Type, ♂, Melbourne, in B.M.

41. *Anthela addita*.

*Darala addita*, Walker, xxxii. p. 372 (1865).

Type, ♀, Tasmania, in B.M.; Victoria, Hobart.

42. *Anthela heliopa*.

*Darala heliopa*, Lower, Trans. Roy. Soc. S. Australia, 1902, p. 214, ♀.

*Anthela heliopa*, Turner, *l. c.* p. 184, ♂.

Type, ♀, Queensland, in Coll. Lower; type, ♂, in Coll. Turner.

43. *Anthela excellens*.

*Darala excellens*, Walker, iv. p. 902 (1855).

Type, ♀, Australia; type, ♂, Sydney, in B.M.; Cairns.

44. *Anthela prima*.

*Darala prima*, Walker, xxxv. p. 1917 (1866).

*Colussa prima*, Kirby, Cat. Lep. Het. i. p. 806 (1892).

Type, Makian, Celebes, in B.M.

45. *Anthela reltoni*.

*Anthela reltoni*, Lower, Trans. Nat. Hist. Soc. Queensland, 1895, p. 106.

*Anthela pyromacula*, Lower, Trans. Roy. Soc. S. Australia, 1905, p. 76.

Type, ♂, Charleville, Queensland, in Queensland Museum; type, ♂, *pyromacula*, Broken Hill, N. S. Wales, in Coll. Lower.

46. *Anthela varia*.

*Darala varia*, Walker, iv. p. 890 (1855), ♂ ♀.

*Darala integra*, Walker, iv. p. 893, ♂.

*Darala hamata*, Walker, iv. p. 896.

*Colussa odenestaria*, Walker, xxi. p. 288 (1860).

*Darala pinguis*, Walker, xxxii. p. 372 (1865).

*Colussa uvaria*, Walker, xxxv. p. 1576 (1866).

*Darala latifera*, Walker, Trans. Ent. Soc. 1862, p. 266.

*Darala caniceps*, Walker, l. c. p. 269.

*Darala limonea*, Butler, Cat. Ent. 1874, p. 291, ♂ ♀.

*Darala succinea*, Lucas, Proc. Linn. Soc. N. S. Wales, 1891, p. 290.

*Darala scortea*, Lucas, l. c.

Types, *varia*, *odenestaria*, *pinguis*, Australia; type, *integra*, New Holland; type, *uvaria*, Moreton Bay; type, *hamata*, Sydney; type, *latifera*, Melbourne; type, *limonea*, Rochampton: all in B.M. Cairns, N. S. Wales, type, *caniceps*, Moreton Bay, in Mus. Oxon.

47. *Anthela acuta*.

*Darala acuta*, Walker, iv. p. 889.

*Darala excisa*, Walker, l. c.

*Darala ferruginea*, Walker, iv. p. 890.

*Darala conspersa*, Walker, l. c.

*Darala simplex*, Walker, l. c.

*Darala plana*, Walker, iv. p. 892.

*Darala subfalcata*, Walker, iv. p. 894.

*Darala falcata*, Walker, iv. p. 895.

*Darala cinerascens*, Walker, iv. p. 900.

*Darala potentaria*, Walker, xvi. p. 1591 (1863).

*Darala rufifascia*, Walker, xxxii. p. 370 (1865).

*Darala delineata*, Walker, xxxii. p. 371.

*Darala quadriplaga*, Walker, Trans. Ent. Soc. 1862, p. 269.

Types, *acuta*, *excisa*, Sydney; type, *conspersa*, without locality; types, *simplex* and *plana*, Sydney; types, *subfalcata* and *rufifascia*, Tasmania: all in B.M.

48. *Anthela repleta*.*Darala repleta*, Walker, iv. p. 896 (1855).*Darala protocentra*, Meyrick, Trans. Roy. Soc. S. Australia, 1891, p. 191.*Darala hæmoptera*, Lower, Trans. Roy. Soc. S. Australia, 1893, p. 150.

Type, ♂, Tasmania, in B.M., Victoria.

49. *Anthela connexa*.*Darala connexa*, Walker, iv. p. 898.*Darala fervens*, Walker, l. c.*Darala postica*, Walker, iv. p. 899.*Darala zonata*, Felder, Reise Nov. pl. xcix. fig. 1 (1868).Type, ♂, *connexa*; type, ♂, *fervens*; type, ♂, *postica*: all in B.M. Type, *zonata*, Australia, in Coll. Rothschild.50. *Anthela nicotthö*.*Bombyx nicotthö*, Boisd. Voy. de l'Astrolabe, i. p. 226 (1832).*Lælia australasia*, Herr.-Schäff. Ausser. Schmett. fig. 380 (1855).*Darala adusta*, Walker, iv. p. 897 (1855).*Darala censors* (misprint), Walker, xxxiii. p. 365 (1865).*Darala consors*, Walker, xxxv. p. 1917 (1868).*Darala rubeola*, Felder, Reise Nov. pl. xcvi. fig. 9 (1868).*Colusa vinosa*, Rosen, Ann. & Mag. Nat. Hist. (5) xvi. p. 384 (1885).Type, *adusta*, Tasmania; type, ♂, *consors*, Australia; type, *vinosa*, Australia: all in B.M. Type, *rubeola*, Australia, in Coll. Rothschild; Victoria, Kangaroo Isl., S. Australia.

The following species unrecognised by Dr. Turner, Proc. Linn. Soc. N.S.W. 1921, p. 190:—

51. *Anthela simplex*.52. *Arnissa simplex*, Walker, Char. Undescr. Lep. p. 77.

Type in National Museum, Melbourne.

53. *Darala linearis*, Lucas, Proc. Linn. Soc. N. S. Wales, 1891, p. 289.54. *Darala rubroscripta*, Lucas, l. c. p. 291.55. *Darala rosea*, Lucas, l. c.56. *Darala cupreotincta*, Lucas, Proc. Linn. Soc. Queensland, 1891, p. 75.57. *Darala trisecta*, Lucas, l. c. 1898, p. 67.58. *Darala maculosa*, Lucas, l. c.59. *Darala consuta*, Lucas, l. c. 1899, p. 139.

Genus *CHENUALA*, Swinhoe, Cat. Het. Mus. Oxon. i.  
p. 212 (fig.) (1892).

60. *Chenuala rufa*.

*Chenuala rufa*, Swinhoe, l. c.

Type, Queensland, in Mus. Oxon.

Genus *CHELEPTERYX*, Gray, Trans. Ent. Soc. i. p. 122 (1832).

61. *Chelepteryx collesi*.

*Chelepteryx collesi*, Gray, l. c.

*Saturnia laplacei*, Feist. Voy. de la Fab. v. 1839, Suppl. p. 20, pl. viii.  
fig. 9.

Queensland, Sydney, Melbourne.

62. *Chelepteryx felderi*.

*Darala chelepteryx*, Felder, Reise Nov. pl. xxviii. fig. 10 (1868).

*Chelepteryx felderi*, Turner, Trans. Ent. Soc. 1904, p. 481.

Type, Victoria, in Coll. Rothschild; Lord Howe Island.

Genus *GEPHYRONEURA*, Turner, Trans. Ent. Soc. 1919, p. 417.

63. *Gephyroneura cosmia*.

*Gephyroneura cosmia*, Turner, Proc. Linn. Soc. N. S. Wales, 1921,  
p. 189.

Type, ♂, Queensland, in Coll. Turner.

Genus *MUNICHRYIA*, Walker, xxxii. p. 395 (1862).

64. *Munichryia senicula*.

*Munichryia senicula*, Walker, l. c. p. 396.

*Hypochromia nyssiata*, Felder, Reise Nov. pl. lxxv. fig. 3 (1874).

Type, Moreton Bay, in B.M.; type, *nyssiata*, in Coll.  
Rothschild.

*Species wrongly referred to the Family.*

65. *Darala lineosa*, Walker, Trans. Ent. Soc. 1862, p. 269  
(Eupterotidæ), not Australia, but Delagoa Bay; type,  
in Mus. Oxon.

66. *Darala expansa*, Lucas, Proc. Linn. Soc. N. S. Wales,  
1891, p. 286 (Eupterotidæ).

67. *Darala serranotata*, Lucas, l. c. p. 138 (Eupterotidæ,  
genus *Cotana*).



Subfamily *LIPARINÆ*.

Genus *DENDROPHLEPS*, Hampson, *Moths of India*, i.  
p. 491 (1892).

-68. *Dendrophleps semihyalina*.

*Dendrophleps semihyalina*, Hampson, *l. c.*

Type, ♂, Khasia Hills, in B.M.

Genus *EUZORA*, Turner, *Proc. Roy. Soc. Queensland*,  
xxvii. p. 492 (1915).

*Caragola*, Moore, *Lep. Atk.* p. 46 (1879) (*præocc.*).

Type, *costalis*, Moore.

-69. *Euzora costalis*.

*Caragola costalis*, Moore, *l. c.* pl. ii. fig. 2.

Type, Sikkim, in Coll. Rothschild.

70. *Euzora collucens*.

*Portheria collucens*, Lucas, *Proc. Linn. Soc. N.S.W.* 1889, p. 1090.

*Euzora collucens*, Turner, *Proc. Linn. Soc. N.S.W.* xiv. (4) p. 492  
(1920).

Type, Atherton, in Coll. Lucas ; Brisbane.

-71. *Euzora clara*.

*Redoa clara*, Walker, xxxii. p. 343 (1865).

*Caviria clara*, Hampson, *Moths of India*, i. p. 489 (1892).

Type, Sikkim, in B.M. ; Khasia Hills.

-72. *Euzora sericea*.

*Stilpnolia sericea*, Moore, *Lep. Atk.* p. 45 (1879) ; Leech, *Trans. Ent.*  
*Soc.* 1899, p. 142.

*Caviria sericea*, Hampson, *l. c.* p. 490.

Type, Sikkim, in B.M. ; Khasia Hills ; W. China.

73. *Euzora kebea*.

*Caragola kebea*, Beth.-Baker, *Nov. Zool.* xv. p. 199 (1908).

Type, Mt. Kebea, N. Guinea, in Coll. Bethune-Baker.

-74. *Euzora ochripes*.

*Stilpnolia ochripes*, Moore, *l. c.*

Type, Darjiling, in Coll. Rothschild ; Chinn Hills, Khasia  
Hills.

Genus **PENDRIA**, Swinhoe, Ann. & Mag Nat. Hist. (7)  
xvii. p. 540 (1906).

Type, *rinaria*, Moore.

—75. *Pendria rinaria*.

*Redoa rinaria*, Moore, Cat. Lep. F. I. Co. ii. p. 336 (1859).

*Leucoma margaritacea*, Snellen, Tijds. v. Ent. xxix. p. 35, pl. i. figs. 2,  
2 a (1886).

*Arctornis snelleni*, Kirby, Cat. Moths, i. p. 432 (1892).

*Pendria rinaria*, Swinhoe, l. c.

Type, Java, in B.M. ; type, *margaritacea*, Sumatra, in  
Coll. Snellen.

76. *Pendria rotundata*.

*Pendria rotundata*, Swinhoe, Ann. & Mag. Nat. Hist. (7) xviii. p. 405  
(1906).

Type, ♂, Nias, in B.M.

—77. *Pendria dica*.

*Redoa dica*, Swinhoe, Trans. Ent. Soc. 1891, p. 478 (note).

*Caviria rinaria*, Hampson (part), Moths of India, i. p. 490 (1892).

Type, ♀, Khasia Hills, in B.M.

78. *Pendria impressa*.

*Leucoma impressa*, Snellen, Tijds. v. Ent. xx. p. 8, pl. i. fig. 1 (1877).

Type, Java, in coll. Snellen ; Sumatra.

—79. *Pendria cygna*.

*Caviria cygna*, Moore, P. Z. S. 1877, p. 601

Type, Ceylon, in B.M. ; Nilgiris, Travancore.

Genus **STILPNOTIA**, Westw. & Humphr. Brit. Moths,  
i. p. 90 (1841).

*Leucosia*, Ramb. Cat. Lep. Andalusie, ii. p. 266 (1860) (note).

*Charala*, Moore, Trans. Ent. Soc. 1884, p. 350.

80. *Stilpnotia salicis*.

*Bombyx salicis*, Linn. Syst. Nat. i. p. 502 (1758).

Throughout Europe, Siberia, Tian Shan, also in the Arctic  
region.

81. *Stilpnotia candida*.*Stilpnotia candida*, Staud. Rom. Mem. Lep. vi. p. 308.*Ab. sohesti*, Capr. Compt. Rend. Soc. E. Belg. xxi. p. 200.

E. Siberia, Urga, Amurland, Japan, Corea, China.

82. *Stilpnotia nigripennata*.*Stilpnotia nigripennata*, Staud. Iris, xii. p. 338.*Ab. nigrociliata*, Fuchs, Jahrb. Nass. Ver. lxvi. p. 71.*Ab. rubicunda*, Strand, Schr. Nat. Ges. Danzig, N.F. x. p. 85.

Tian Shan, Germany, South Norway.

83. *Stilpnotia flavisulphurea*.*Leucoma flavisulphurea*, Ersch. Hor. Soc. Ent. Ross. viii. p. 310 (1872).

Ferghana, Sarafshan district, Samarcand.

84. *Stilpnotia cretacea*.*Stilpnotia cretacea*, Strand, Rebb. Cat. Pal. Lep. p. 117.

Tayk-kul.

85. *Stilpnotia ochropoda*.*Liparia ochropoda*, Eversm. Bull. Mosc. xx. (2) p. 76, pl. v. figs. 1-3 (1847).

Dauria, S.E. Siberia, Ussuri District.

86. *Stilpnotia sartus*.*Ocneria sartus*, Ersch. Fedchenko's Reise Lep. p. 86, pl. ii. fig. 32 (1874).

Turkestan, Sarafkan District, Ferghana, Issyk, Kul-Tianshe.

Genus *LEUCOMA*, Ill. Brit. Ent. Haust. ii. p. 64 (1829).*Laria*, Schrank, Fauna Boica, ii. (2) pp. 147, 150 (1802) (præocc.).87. *Leucoma cygna*.*Redoa cygna*, Moore, P. Z. S. 1879, p. 401.*Redoa cymbicornis*, Butler, Ill. Hst. v. p. 48, pl. lxxxix. fig. 2, ♀ (1881).*Redoa nigricilia*, Swinhoe, Trans. Ent. Soc. 1881, p. 478.*Laria l-nigrum*, Leech, Trans. Ent. Soc. 1889, p. 127 (part.).Type, ♀, India, in B.M.; types, *cymbicornis*, Sikkim; type, *nigricilia*, Khasia Hills: all in B.M. W. China.

88. *Leucoma connua*.

*Ocinara connua*, Hutton, Trans. Ent. Soc. 1865, p. 380.

Type, Mussuri, in B.M. ; Dhera-Dun, N. Burma.

Genus *Redoa*, Walker, iv. p. 826 (1855).

*Homœomeria*, Wallgrn. K. Vet.-Akad. Handl. (2) v. (4) p. 36 (1865).

Type, *submarginata*, Walker.

89. *Redoa submarginata*.

*Redoa submarginata*, Walker, l. c. ; Butler, Ill. Het. v. p. 18, pl. lxxxvi. fig. 3 (1881) ; Turner, Proc. Linn. Soc. N.S.W. xlv. (4) p. 492 (1920).

*Redoa transiens*, Walker, Trans. Linn. Soc. v. p. 128 (1862).

*Leucoma hipparia*, Swinhoe, Ann. & Mag. Nat. Hist. (6) xii. p. 214 (1893).

Type, Sylhet, in B.M. Type, *transiens*, Sarawak ; type, *hipparia*, Khasia Hills : both in B.M.

90. *Redoa maria*.

*Redoa maria*, Kirby, Ann. & Mag. Nat. Hist. (6) xviii. p. 383 (1890).

Type, Mtze, E. Africa, in B.M.

91. *Redoa flavicapilla*.

*Leucoma flavicapilla*, Wallgrn. Wien. ent. Mon. iv. p. 163 (1860).

*Homœomeria flavicapilla*, Wallgrn. K. Vet.-Akad. Handl. (2) v. (4) p. 36 (1865).

Caffraria.

92. *Redoa sericea*.

*Redoa sericea*, Kenrick, Trans. Ent. Soc. 1913, p. 599.

Type, ♂ ♀, Madagascar, in Coll. Kenrick.

93. *Redoa roseicoxa*.

*Redoa roseicoxa*, Kenrick, l. c. pl. xxxi. fig. 11.

Type, ♀, Madagascar, in Coll. Kenrick.

94. *Redoa costalis*.

*Leucoma costalis*, Swinhoe, Ann. & Mag. Nat. Hist. (7) xvii. p. 541 (1906).

Type, ♂, Uganda, in B.M.

95. *Redoa pruinosa*.

*Leucoma pruinosa*, Butler, Ann. & Mag. Nat. Hist. (5) iv. p. 236 (1879).

*Arctornis pruinosa*, Kirby, Cat. Moths, i. p. 433 (1892).

Type, ♀, Madagascar, in B.M.

96. *Redoa nitida*.

*Leucoma nitida*, Swinhoe, Trans. Ent. Soc. 1903, p. 379.

Types, ♂ ♀, Old Calabar, in B.M., Ogove River, Sapele, Niger River. Gold Coast, all females.

97. *Redoa aurifrons*.

*Euproctis aurifrons*, Müschler, Abh. Senck. Ges. xv. p. 75, fig. 3 (1887).

*Leucoma aurifrons*, Swinhoe, l. c. p. 385 (note).

Aburi, Gold Coast.

98. *Redoa luteipes*.

*Stilpnolia luteipes*, Walker, iv. p. 843, ♀ (1855)

*Homæomeria luteipes*, Kirby, l. c. p. 437.

*Leucoma luteipes*, Swinhoe, l. c. p. 379 (note).

*Redoa laba*, Schaus & Clements, Lep. Sierra Leone, p. 25, pl. i. fig. 4, ♂ (1893).

*Redoa ogovensis*, Holland, Ent. News Phil. 1893, p. 63, pl. iii. figs. 12, 13.

Type, ♀, Sierra Leone, in B.M.; Old Calabar.

99. *Redoa tiphia*.

*Leucoma tiphia*, Swinhoe, l. c. p. 381.

Types, ♂ ♀, Nairobi Forest, Kikuyu, B.E. Africa, in B.M.

100. *Redoa usebia*.

*Leucoma usebia*, Swinhoe, l. c. p. 382.

Type, ♂, Nyassa, in B.M.

101. *Redoa crocipes*.

*Cypra crocipes*, Boisd. Faun. Madag. p. 87, pl. xii. fig. 2 (1833).

Madagascar.

102. *Redoa tavetensis*.

*Leucoma tavetensis*, Holland, Ent. Suppl. xxv. p. 93 (1895); Swinhoe, l. c. (note).

*Antiphella telesilla*, Druce, Ann. & Mag. Nat. Hist. (7) iii. p. 469 (1899).

Type, Kilimanjaro, in U.S. Nat. Mus. ; type, ♂, *tellisilla*, Zanzibar, in Coll. Joicey.

103. *Redoa gracillima*.

*Leucoma gracillima*, Holland, Ent. News Phil. 1893, p. 64, pl. iii. fig. 9.

Ogove River, Old Calabar.

104. *Redoa vata*.

*Leucoma vata*, Swinhoe, l. c.

Type, ♂, River Niger, Sapele, in B.M.

105. *Redoa nivosa*.

*Leucoma nivosa*, Walker, xxxii. p. 344, ♀ (1863) (described as ♂).

Type, ♀, Mt. Ophir, Malacca, in Mus. Oxon.

106. *Redoa niveata*.

*Euproctis niveata*, Walker, xxxii. p. 350, ♀ (described as ♂).

Type, ♀, Makian, Celebes, in Mus. Oxon.

107. *Redoa intacta*.

*Redoa intacta*, Walker, xxxv. p. 1916, ♀ (1866) (described as ♂).

Type, ♀, N. Guinea, in Mus. Oxon.

108. *Redoa perfecta*.

*Redoa perfecta*, Walker, Journ. Linn. Soc. vi. p. 128 (1862).

Type, Sarawak, in Mus. Oxon ; Ké Island, Perak.

-109. *Redoa flavescens*.

*Redoa flavescens*, Moore, P. Z. S. 1877, p. 600.

*Redoa sericea*, Moore, l. c.

Both types, Andamans, in B.M.

110. *Redoa albifrons*.

*Leucoma albifrons*, Beth.-Baker, Ann. & Mag. Nat. Hist. (8) vii. p. 540 (1911).

Type, ♂, Oni, Lagos, in Mus. Oxon.

111. *Redoa albissima*.*Leucoma albissima*, Beth.-Baker, *l. c.*

Types, ♂ ♀, N. Dalla, 2700 ft., in Coll. Bethune-Baker.

-112. *Redoa thyridoptera*.*Leucoma thyridoptera*, Hampen. Journ. Bombay Nat. Hist. Soc. xx. (1) p. 114, pl. E. fig. 5 (1910).

Type, ♀, Ceylon, in B.M.

113. *Redoa micacea*.*Redoa micacea*, Walker, Journ. Linn. Soc. vi. p. 127 (1862).

Type, Borneo, in B.M.; Java.

114. *Redoa egerina*.*Leucoma egerina*, Swinhoe, Ann. & Mag. Nat. Hist. (6) xii. p. 214 (1893).

Type, Singapore, in B.M.

115. *Redoa marginalis*.*Redoa marginalis*, Walker, Journ. Linn. Soc. vi. p. 128 (1862).

Type, Sarawak, in Mus. Oxon.; Kuching, Singapore; Ké Island; Mt. Kelva, B. N. Guinea; Philippines.

-116. *Redoa moorei*.*Leucoma moorei*, Leech, Trans. Ent. Soc. 1899, p. 143.*Redoa alba*, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 32 (1877) (præocc.).Type, China, in B.M. Type, *alba*, Shanghai, in B.M.; Gensan, Ichang, Chang-Yang, Omcishan, Moupin, Wa-Shan.-117. *Redoa diaphana*.*Redoa diaphana*, Moore, Lep. Atk. p. 46, no. 1051, ♂.*Redoa lactea*, Moore, *l. c.* no. 153, ♀.

Both types, Darjiling, in B.M.

118. *Redoa minutissima*.*Leucoma minutissima*, Swinhoe, Trans. Ent. Soc. 1903, p. 380.

Type, Sarawak, in B.M.

119. *Redoa acesta*.*Laria acesta*, Snellen, Tijd. v. Ent. xxiv. p. 128 (1881).

Type, Luzon, Philippines, in Coll. Snellen.

120. *Redoa rufimarginata*.

*Leucoma rufimarginata*, Swinhoe, Trans. Ent. Soc. 1903, p. 383.

Type, ♂ ♀, Pulo Laut, in B.M.

121. *Redoa primula*.

*Leucoma primula*, Swinhoe, l. c.

Type, ♂ ♀, Sangir, in B.M.

122. *Redoa flora*.

*Leucoma flora*, Swinhoe, l. c.

Type, ♂, Pulo Laut, in B.M.

123. *Redoa discirufa*.

*Leucoma discirufa*, Swinhoe, l. c. p. 384.

Type, Pulo Laut, in B.M.

124. *Redoa lobipennis*.

*Leucoma lobipennis*, Swinhoe, Cat. Het. Mus. Oxon. i. p. 203 (1892).

Type, ♂, Dorey, in B.M.

125. *Redoa riguada*.

*Leucoma riguada*, Snellen, Deutsch. ent. Zeit., Lep. viii. p. 138 (1895).

Type, ♂ ♀, Deli, Sumatra, in Coll. Snellen.

126. *Redoa pulverulenta*.

*Leucoma pulverulenta*, Snellen, l. c.

Type, ♂, Deli, Sumatra, in Coll. Snellen.

-127. *Redoa pellucida*.

*Leucoma pellucida*, Swinhoe, l. c. p. 381.

Type, Khasia Hills, in B.M.

-128. *Redoa divisa*.

*Euproctis divisa*, Walker, iv. p. 836 (1855).

*Leucoma divisa*, Swinhoe, l. c. p. 380 (note).

Type, Sylhet, in B.M.

-129. *Redoa silhetica*.

*Penora silhetica*, Walker, xxxii. p. 341 (1865).

Type, Sylhet, in B.M.; Khasia Hills.



130. *Redoa semihyalina*.

*Leucoma semihyalina*, Swinhoe, Ann. & Mag. Nat. Hist. (7) xiv. p. 421 (1904).

Type, Padang, Sumatra, in B.M.

- Genus *CARRIOLA*, nov.

Fore wing with the costa arched, apex slightly rounded, outer margin nearly straight to the hinder margin, which is rounded, cell very broad, vein 5 from above the lower angle, 6 from the upper angle, 7, 8, 9, and 10 stalked near apex; hind wing with the outer margin rounded; wing hyaline; antennæ slightly pectinated in both sexes. Abdomen of male slender, of female robust.

Type, *ecnomoda*, Swinhoe.

131. *Carriola ecnomoda*.

*Leucoma ecnomoda*, ♂, Swinhoe, Ann. & Mag. Nat. Hist. (7) xx. p. 77 (1907); ♀, Swinhoe, l. c. (8) xviii. p. 215 (1916).

Type, ♂, Padang, Sumatra, in B.M.; type, ♀, Padang, in Coll. Swinhoe.

132. *Carriola saturnioides*.

*Lalía saturnioides*, Snellen, Tijds. v. Ent. xxii. p. 105, pl. viii. figs. 7, 7a-e (1879).

*Leucoma saturnioides*, Swinhoe, Trans. Ent. Soc. 1903, p. 384 (note).

Type, Celebes, in Coll. Snellen. Singapore, Philippines.

-133. *Carriola fenestrata*.

*Leucoma fenestrata*, Hampson, Moths of India, i. p. 489 (1892).

*Macrauzata fenestrata*, Hampson, Ill. Het. ix. p. 78, pl. clx. fig. 16 (1893).

Type, ♀, Ceylon, in B.M.

Genus *PSEUDARCTIA*, Beth.-Baker, Ann. & Mag. Nat. Hist. (8) vii. p. 540 (1911).

134. *Pseudarctia nivea*.

*Pseudarctia nivea*, Beth.-Baker, l. c.

Type, ♀, N'teli, Uganda, in Coll. Bethune-Baker.

- Genus KANCHIA, Moore, Lep. Ceylon, ii. p. 92 (1883).

- 135. *Kanchia subvitrea*.

*Leucoma subvitrea*, Walker, xxxii. p. 344 (1865).

*Kanchea subvitrea*, Moore, l. c. p. 93, pl. cxiii. fig. 5 (1883).

Type, Bengal, in B.M.; Khasia Hills, Nilgiris, Ceylon, W. China.

Genus HEXANEURA, Wallgrn. Wien. ent. Mon.  
iv. p. 164 (1860).

136. *Hexaneura cinnamomea*.

*Hexaneura cinnamomea*, Wallgrn. l. c.; Kirby, Cat. Moths, i. p. 433 (1892).

Caffraria.

137. *Hexaneura maculifera*.

*Hexaneura maculifera*, Wallgrn. l. c.; Kirby, l. c.

Caffraria.

Genus IVELA, Swinhoe, Trans. Ent. Soc. 1903, p. 388.

- 138. *Ivela auripes*.

*Leucoma auripes*, Butler, Ann. & Mag. Nat. Hist. (4) xx. p. 402 (1877); Butler, Ill. Het. ii. p. 9, pl. xxiv. fig. 1 (1878).

*Ivela auripes*, Swinhoe, l. c.

Type, Japan, in B.M.; Omeishan, W. China.

139. *Ivela eleuterioides*.

*Cypra eleuterioides*, Semper, Het. Philipp. iii. p. 470, pl. xiv. fig. 9, ♀ (1898).

Types, ♂ ♀, N.E. Luzon, in Coll. Semper.

Genus SITVIA, Walker, xxxii. p. 387 (1865).

*Kettelia*, Butler, Trans. Linn. Soc. (2) i. p. 560 (1879).

140. *Sitvia denudata*.

*Sitvia denudata*, Walker, l. c.

*Kettelia lowii*, Butler, l. c.

Type, Malacca, in Mus. Oxon.; type, *lowii*, Borneo, in B.M. Penang.

Ann. & Mag. N. Hist. Ser. 9. Vol. x.

32

141. *Sitvia keroli*.

*Kettelia keroli*, Semper, *l. c.* p. 475, pl. liv. fig. 10, ♀ (1898).

Types, ♂ ♀, N. Luzon and E. Mindanao, in Coll. Semper.

Genus *CREAGRA*, Wallgrn. K. Vet.-Akad. Handl. (2)  
v. (4) p. 38 (1865).

142. *Creagra dealbata*.

*Liparis dealbata*, Herr.-Schäff. Ausser. Schmett. i. fig. 111 (1854).

*Creagra dealbata*, Wallgrn. *l. c.*

*Lalia aliena*, Wallgrn. Wien. ent. Mon. iv. p. 162 (1800).

S. Africa, Knysna.

143. *Creagra translucida*.

*Leucoma translucida*, Oberth. Ann. Mus. Genov. iv. p. 117, pl. i. fig. 6  
(1880).

*Creagra translucida*, Kirby, Cat. Moths, i. p. 461 (1892).

Abyssinia.

144. *Creagra macrocera*.

*Leucoma macrocera*, Sharpe, Ann. & Mag. Nat. Hist. (6) v. p. 145  
(1890).

*Creagra macrocera*, Kirby, *l. c.*

E. Africa.

145. *Creagra* (?) *albina*.

*Leucoma albina*, Plötz, Stett. ent. Zeit. xii. p. 84 (1880).

*Creagra* (?) *albina*, Kirby, *l. c.*

Bonjongo.

146. *Creagra* (?) *parva*.

*Leucoma parva*, Plötz, *l. c.*

*Creagra* (?) *parva*, Kirby, *l. c.*

Aburi.

Genus *CALTURA*, Moore, P. Z. S. 1879, p. 401.

—147. *Caltura alba*.

*Caltura alba*, Moore, *l. c.*; Moore, Lep. Ceylon, ii. p. 98, pl. cxiv.  
figs. 2 a, b (1882).

Type, Ceylon, in Mus. Dublin.

- Genus *ARUTA*, nov.

Hind tibiæ without spurs, hind wing with veins 6 and 7 on a long stalk, palpi minute (Section iii. Hampson's 'Moths of India,' i. p. 493).

-148. *Aruta flavipes*.

*Cispia flavipes*, Hampson's Moths of India, i. p. 493 (1892).

Type, ♀, Sikkim, in B.M.

- Genus *AXANA*, nov.

Hind tibiæ with one pair of spurs, hind wing with veins 6 and 7 from cell (Section ii. Hampson's 'Moths of India,' i. p. 493).

-149. *Axana puncticilia*.

*Naxa puncticilia*, Moore, P.Z. S. 1872, p. 575.

*Cispia puncticilia*, Hampson's Moths of India, i. p. 493 (1892).

*Callura puncticilia*, Swinhoe, Cat. Het. Mus. Oxon. i. p. 204 (1892).

Types, ♂, Nilgiris, in Mus. Oxon.; both types are males, not male and female as stated by Moore.

Genus *NAROMA*, Walker, vii. p. 1744 (1856).

*Hysibada*, Walker, xxxii. p. 497 (1865).

*Zarfa*, Walker, Proc. N. H. Soc. Glasg. i. p. 338 (1869).

150. *Naroma signifera*.

*Naroma signifera*, Walker, l. c.

*Hysibada varipes*, Walker, xxxii. p. 498 (1865).

*Zarfa lunifera*, Walker, Proc. N. H. Soc. Glasg. i. p. 339.

Type, ♂, Sierra Leone; type, *varipes*, ♀, Natal; type, ♀, *lunifera*: all in B.M. Congo, Accra, Old Calabar, Uganda, Nigeria.

- Genus *HIMALA*, Moore, Lep. Atk. p. 57 (1879).

-151. *Himala argentea*.

*Redoa argentea*, Walker, iv. p. 827 (1855), ♂.

*Himala argentea*, Moore, l. c.; Butler, Ill. Het. v. p. 49, pl. lxxxix. fig. 6 (1881).

*Dasychira ulita*, Moore, Cat. Lep. E. I. Co. ii. p. 341 (1859), ♀.

Type, ♂, Kangra; type, ♀, Darjiling: both in B.M. Assam, Dalhousi, Dehra Dhun.

—Genus *GAZALINA*, Walker, xxxii. p. 398 (1865).

*Oligoclona*, Felder, Reise Nov. pl. xciv. fig. 10 (1868).

—152. *Gazalina apsara*.

*Dasychira apsara*, Moore, Cat. Lep. E. I. Co. ii. p. 341 (1859).

Type, N. India, in B.M.

—152a. *Gazalina venosata*.

*Gazalina venosata*, Walker, l. c., ♂; Butler, Ill. Het. B.M. v. p. 49, pl. lxxxix. fig. 5 (1881).

*Oligoclona nervosa*, Felder, l. c. pl. xcv. fig. 8, ♀ (1868).

Type, ♂, Sikkim, in B.M.; type, ♀, *nervosa*, N. India, in Coll. Rothschild.

—153. *Gazalina chrysolopha*.

*Liparis chrysolopha*, Kollar, Hugel's Kash. iv. p. 470 (1844).

*Dasychira antica*, Walker, iv. p. 867 (1855).

*Gazalina antica*, Butler, Ill. Het. v. p. 49, pl. lxxxix. fig. 4 (1881).

*Oligoclona chordigera*, Felder, Reise Nov. pl. xciv. fig. 10 (1868).

Type, Kashmir; type, *antica*, N. India, in B.M.; type, *chordigera*, Darjiling, in Coll. Rothschild; Dalhousie, Kangra, Sikkim, Washan, Chang-Yang, Kwei-chow.

—154. *Gazalina transversa*.

*Dasychira transversa*, Moore, Lep. Atk. p. 47, pl. ii. fig. 22 (1879).

*Gazalina transversa*, Hampson, Moths of India, i. p. 469 (1892).

Type, Sikkim, in B.M.

—155. *Gazalina intermixta*.

*Gazalina intermixta*, Swinhoe, Ann. & Mag. Nat. Hist. (7) vi. p. 306 (1900); Swinhoe, Trans. Ent. Soc. 1903, p. 389 (note).

Type, Jaintia Hills, in B.M.; Khasia Hills.

Genus *STRACENA*, Swinhoe, l. c. p. 388.

156. *Stracena fuscivena*.

*Stracena fuscivena*, Swinhoe, l. c., ♀; Swinhoe, l. c. 1904, p. 144, ♂.

Type, ♂ ♀, River Niger, Sapele, in B.M.; Ashanti, Old Calabar.

157. *Stracena promelena*.

*Sulychra promelena*, Holland, Ent. News Phil. iv. p. 61, pl. iii. fig. 11 (1893)

River Gaboon.

Genus *SAPELIA*, Swinhoe, *l. c.* p. 389.

158. *Sapelia limpida*.

*Sapelia limpida*, Swinhoe, *l. c.*

Types, ♂ ♀, River Niger, Sapele, in B.M.

159. *Sapelia flavipectus*.

*Sapelia flavipectus*, Swinhoe, Ann. & Mag. Nat. Hist. (7) xiv. p. 131 (1904).

Type, ♂, Ashanti; type, ♀, Sapele, River Niger: both in B.M.

Genus *OLAPA*, Walker, iv. p. 823 (1855).

*Antiphella*, Walker, vii. p. 1743 (1856).

160. *Olapa flabellaria*.

*Phalæna flabellaria*, Fabr. Mant. Ins. ii. p. 188 (1787).

*Liparis crocicollis*, Herr.-Schäffer, Aussereur. Schmett. i. fig. 110 (1854).

*Olapa temperata*, Walker, iv. p. 823.

*Antiphella vecontia*, Druce, Ann. & Mag. Nat. Hist. (7) iii. p. 469 (1899).

Type, *temperata*, S. Africa, in B.M.; type, *vecontia*, n coll. Joicey; Abyssinia, Knysna, Natal, Cape.

161. *Olapa argenna*.

*Cypra argenna*, Mab. Ann. Soc. Ent. France, lviii. p. 725 (1899).

Madagascar.

Genus *OGOA*, Walker, vii. p. 1763 (1856).

162. *Ogoa simplex*.

*Ogoa simplex*, Walker, vii. 1764.

Type, Natal, in B.M.

Genus *CROPERA*, Walker, iv. p. 825.

163. *Cropera testacea*.

*Cropera testacea*, Walker, iv. p. 826.

Type, Natal, in B.M.

164. *Cropera adpersa*.

*Liparis adpersa*, Herr.-Schäffer, Aussereur. Schmett. fig. 109 (1854).

*Lælia proluxa*, Wallgru. Wien. ent. Mon. iv. p. 162 (1860).

Natal.

165. *Cropera fulvinotata*.

*Olapa fulvinotata*, Butler, P. Z. S. 1893, p. 678.

Type, Zomba, in B.M.

\*Genus *CROREMA*, Walker, iv. p. 811 (1855).

166. *Crorema mentiens*.

*Crorema mentiens*, Walker, l. c.

*Cyprin* (?) *obliqua*, Walker, vii. p. 1734 (1856).

*Euproctis ampla*, Walker, xxxii. p. 346 (1865).

Type, Congo; types, *obliqua* and *ampla*, Sierra Leone, all in B.M.; Old Calabar, S. Nigeria, Gold Coast.

Genus *TOPOMESA*, Walker, xxxv. p. 1921 (1866).

-167. *Topomesa subinans*.

*Topomesa subinans*, Walker, l. c.

Type, ♂, Java, in B.M.; Borneo, Singapore, Tenasserim.

-168. *Topomesa discolor*.

*Topomesa discolor*, Hampson, Moths of India, iv. p. 490 (1896).

Type, ♂, Ceylon, in B.M.

-169. *Topomesa lerna*.

*Topomesa lerna*, Swinhoe, Ann. & Mag. Nat. Hist. (7) iii. p. 111 (1899).

Type, Karwar, S. India, in B.M.

170. *Topomesa* (?) *rutila*.

*Bombyx rutila*, Fabr. Mant. Ins. ii. p. 123 (1781).

*Topomesa* (?) *rutila*, Kirby, Cat. Moths, i. p. 919 (1892).

Siam.

-Genus *COBANILLA*, Moore, Lep. Ceylon, ii. p. 120 (1883).

-171. *Cobanilla marginata*.

*Cobanilla marginata*, Moore, l. c. p. 121, pl. cxxiv. fig. 4.

Type, ♂, Ceylon, in B.M.

172. *Cobanilla plumbacea*.

*Cobanilla plumbacea*, Swinhoe, Fasciculi Mayalensis, i. p. 62 (1903).

Type, ♂, Bukit Besar, Namgchik, in Mus. Oxon.

Genus OLIGERIA, Turner, Proc. Linn. Soc. N.S.W.  
xlv. (4) p. 12 (1920).

173. *Oligeria hemicalla*.

*Orgyia hemicalla*, Lower, Trans. Roy. Soc. S. Australia, xxix. p. 170 (1905).

*Oligeria hemicalla*, Turner, l. c.

Type, Victoria, in coll. Lower; Melbourne.

Genus ANEPA, Swinhoe, Trans. Ent. Soc. 1903, p. 478.

*Acyphas*, Turner (nec Walker), l. c. p. 481 (note).

Turner says *Anepa* must sink to *Acyphas* because Kirby has fixed the type of *Acyphas* as *fulviceps*, Walker, but the type of *Acyphas* fixed by Walker himself is *viridescens*, which is a true *Orgyia* = *Dasychira* (*Orgyia* having precedence). It is a well-recognized fact that Walker's type is the first species described by him following the description of his genus; Hampson and others have always followed this ruling—it is absurd to suppose that anyone but the author himself can fix his type.

Type, *Acyphas fusca*, Walker.

174. *Anepa fulviceps*.

*Charnülas fulviceps*, Walker, iv. p. 707 (1855).

*Acyphas fusca*, Walker, iv. p. 798.

Type, ♂, Australia, in B.M.; Tasmania.

175. *Anepa chionitis*.

*Euproctis chionitis*, Turner, Trans. Roy. Soc. S. Australia, p. 177 (1902).

*Acyphas chionitis*, Turner, Proc. Linn. Soc. N.S.W. xlv. (4) p. 481 (1920).

Queensland, Stradbroke Isl., Adelaide, Waroona.

176. *Anepa leucomelas*.

*Euproctis leucomelas*, Walker, iv. p. 838 (1855).

*Euproctis obsoleta*, Walker (nec Fabr.), iv. p. 839.

*Porthesia anacaula*, Meyrick, Trans. Roy. Soc. S. Aust. xv. p. 193 (1891).

*Porthesia hololeuca*, Meyrick, l. c.

*Acyphas leucomelas*, Turner, Proc. Linn. Soc. N.S.W. xlv. (4) p. 481 (1920).

Melbourne, Gisborne, Mt. St. Bernard, Tasmania.

177. *Anepa amphideta*.

*Euproctis amphideta*, Turner, Trans. Roy. Soc. S. Aust. 1902, p. 177.

*Acyphas amphideta*, Turner, Trans. Linn. Soc. N.S.W. xlv. (4) p. 482 (1920).

N. Queensland.



178. *Anepa leptotypa*.*Euproctis leptotypa*, Turner, Trans. Ent. Soc. 1904, p. 475.*Acyphas leptotypa*, Turner, Trans. Linn. Soc. N.S.W. xlv. (4) p. 481.

Townsville, N. Queensland.

Genus *HABROPHYLLA*, Turner, *l. c.* p. 482.179. *Habrophylla eurygona*.*Euproctis eurygona*, Lower, Trans. Roy. Soc. S. Aust. xxvi. p. 213 (1902).*Habrophylla eurygona*, Turner, *l. c.*

Type, Queensland, in coll. Lower.

-Genus *ARCTORNIS*, Germ. Gloss. Prodr. p. 18 (1810);  
type, *chrysorrhæa*, Linn.*Euproctis*, Hübner, Verz. bek. Schmett. p. 193 (1818); type, *auriflua*, Schiff.*Porthesia*, Steph. Ill. Brit. Ent. Haust. ii. p. 66 (1829); type, *chrysorrhæa*, Espar.*Chionophasma*, Butler, Trans. Ent. Soc. 1880, p. 384; type, *paradoxa*, Butler.180. *Arctornis chrysorrhæa*.*Phalæna chrysorrhæa*, Linn. Syst. Nat. x. (1) p. 502 (1758).*Phalæna auriflua*, Fabr. Mant. Ins. p. 125 (1787).*Phalæna similis*, Fuessly, Verz. Schiner's Ins. p. 35 (1775).*Porthesia similis*, Strand, Seitz's Macrolep. ii. p. 134, pl. xxi. fig. 1 (1917).Ab. *Porthesia nyctea*, Gr. Grsh. Hor. Ent. Ross. xxv. p. 404.Ab. *trimaculata*, Strand, Seitz's Macrolep. ii. p. 134 (1917).Ab. *quadrimaculata*, Strand, *l. c.**Arctornis chrysorrhæa*, Rothschild, Nov. Zool. xxiv. p. 355 (1917).

Balkans, Armenia, Altai, Amurland, Corea, Japan, China, Italy.

181. *Arctornis melania*.*Porthesia melania*, Strand, in Seitz's Macrolep. ii. p. 134 (1917).Ab. *melanioides*, Strand, *l. c.*

Mesopotamia, Kurdistan, Asia Minor.

182. *Arctornis alba*.*Aroa alba*, Brem. Bull. Acad. Pet. iii. p. 478 (1861); Brem. Lep. Ost-Seb. p. 41, pl. iii. fig. 18 (1864).*Redoa sinensis*, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 92 (1877).*Leucorma alba*, Leech, Trans. Ent. Soc. 1899, p. 143.Ab. *depunctata*, Strand, in Seitz's Macrolep. ii. p. 123 (1917).Type, *sinensis*, Shanghai, in B.M.; Fusan.

183. *Arctornis rebeli*.

*Porthesia rebeli*, Haberh. Soc. Ent. xvii. p. 82; Strand, in Seitz's Macrolep. ii. p. 134 (1917).

Slivno.

184. *Arctornis torasan*.

*Euproctis torasan*, Wileman, Trans. Ent. Soc. 1911, p. 272.

*Porthesia torasan*, Strand, l. c. p. 135, pl. xxiii. a.

185. *Arctornis tsingtaulca*.

*Porthesia tsingtaulca*, Strand, l. c. pl. xxiii. a.

Type, Tsingtau, in coll. Seitz.

-186. *Arctornis virguncula*.

*Euproctis virguncula*, Walker, iv. p. 836 (1855).

*Euproctis marginalis*, Walker, vii. p. 173 (1856); Butler, Ill. Het. v. p. 51, pl. lxxxix. fig. 12 (1880).

Both types, N. India, in B.M.

187. *Arctornis paradoxa*.

*Chionophasma paradoxa*, Butler, Trans. Ent. Soc. 1886, p. 385, pl. ix. fig. 2, ♀.

*Porthesia paradoxa*, Turner, Proc. Linn. Soc. N.S.W. xli. (4) p. 478 (1920).

*Porthesia panabra*, Turner, Trans. Ent. Soc. S. Austr. 1902, p. 176.

Type, Queensland, in B.M.; Boudin Isl., Damma Isl.

188. *Arctornis galactopis*.

*Porthesia galactopis*, Turner, l. c.

Type, Queensland, in coll. Turner.

189. *Arctornis euthysana*.

*Porthesia euthysana*, Turner, l. c. p. 175.

Type, Queensland, in coll. Turner.

190. *Arctornis melanosoma*.

*Porthesia melanosoma*, Butler, Ann. & Mag. Nat. Hist. (5) ix. p. 87 (1882).

*Porthesia mixta*, Butler, l. c. p. 88.

Type, Melbourne; type, *mixta*, Tasmania: both in B.M.

191. *Arctornis fimbriata*.

*Teura fimbriata*, Lucas, Proc. Linn. Soc. N.S.W. 1891, p. 285.

*Porthesia fimbriata*, Turner, l. c. p. 176.

Type, Queensland, in coll. Lucas.

192. *Arctornis aliena*.

*Porthesia aliena*, Butler, Trans. Ent. Soc. 1886, p. 386.

Type, Peak Downs, in B.M.

193. *Arctornis semiochrea*.

*Porthesia semiochrea*, Herr.-Schäff. l. c. fig. 390 (1855).

*Leucoma semiochrea*, Kirby, Cat. Moths, i. p. 445 (1892).

Australia.

194. *Arctornis falkensteini*.

*Euproctis falkensteini*, Dew. Verh. Leop. Car. Akad. xlii. p. 69 (1881).

*Leucoma falkensteini*, Kirby, l. c. p. 446.

Chinchow.

195. *Arctornis nigrifrons*.

*Porthesia nigrifrons*, Swinhoe, Trans. Ent. Soc. 1903, p. 393.

Type, Kikuyu, Africa, in B.M.

196. *Arctornis producta*.

*Euproctis producta*, Walker, P. Z. S. 1803, p. 168.

*Porthesia depauperata*, Mab. Comptes Rend. Soc. Ent. Belg. xxiii. p. xvii (1880).

Type, Madagascar, in B.M.; Dar-es-Salam, E. Africa.

197. *Arctornis putilla*.

*Euproctis putilla*, Saalm, Lep. Mudg. p. 184 (1884).

*Leucoma putilla*, Kirby, Cat. Moths, i. p. 446 (1892).

Nossi-Bé.

198. *Arctornis l-nigrum*.

*Bombyx l-nigrum*, Müll. Faun. Fride, p. 40 (1704).

*Bombyx c-nigrum*, Fabr. Syst. Ent. p. 577 (1775).

Japan, Tokio, Sweden, Denmark, E. Europe, Armenia, Amurland.

199. *Arctornis acatharta*.

*Porthesia acatharta*, Turner, Trans. Roy. Soc. S. Austr. p. 124 (1896).

N. Australia, Port Darwin, Cairns.

200. *Arctornis xuthoptera*.

*Porthesia xuthoptera*, Turner, Proc. Linn. Soc. N.S.W. xlv. (4) p. 479 (1920).

Kuranda, near Cairns, Stannary Hills.

201. *Arctornis pulvereæ*.

*Porthesia pulvereæ*, Hampson, Mon. Christmas Isl. p. 69, pl. ix. fig. 9 (1900).

Type in B.M.

202. *Arctornis irrorata*.

*Euproctis irrorata*, Moore, Cat. Lep. E. I. Co. ii. p. 347 (1859).

Type, ♀, Java, in B.M.

—203. *Arctornis xanthorrhæa*.

*Liparis xanthorrhæa*, Kollar, Hugel's Kasch. p. 470 (1844).

*Euproctis subdita*, Moore, P. Z. S. 1879, p. 400.

*Euproctis subnigra*, Moore, Lep. Atk. p. 48 (1879).

Type, *subdita*, Ceylon; type, *subnigra*, Khasia Hills: both in B.M. Punjab, Sultanpore, Umballa, Kangra, Jawur Hills, Travancore.

—204. *Arctornis flavonigra*.

*Euproctis flavonigra*, Moore, P. Z. S. 1879, p. 400, pl. xxxii. fig. 11, ♂.

Type, Nepal, in B.M.; Solon, Simla, in my coll.

205. *Arctornis fulvonigra*.

*Porthesia fulvonigra*, Swinhoe, Trans. Ent. Soc. 1903, p. 395.

Types, ♂ ♀, Guadalcanar Isl., Solomons, in B.M.

—206. *Arctornis aurantiaca*.

*Porthesia aurantiaca*, Hampson, Moths of India, i. p. 455 (1892).

Type, Sikkim, in B.M.

—207. *Arctornis stigmatifera*.

*Porthesia stigmatifera*, Hampson, Moths of India, iv., App. p. 491 (1890).

Type, ♀, Bhutan, in B.M.

208. *Arctornis gracilior*.

*Porthesia gracilior*, Pag. Jahrb. Miss. Ver. xxxix. p. 131 (1886).

*Leucoma gracilior*, Kirby, Cat. Moths, i. p. 445 (1892).

Aru.

209. *Arctornis trispila*.

*Porthesia trispila*, Turner, Proc. Linn. Soc. N.S.W. xlv. (4) p. 479 (1920).

Kuranda.

210. *Arctornis melambaphes*.*Porthesia melambaphes*, Turner, l. c. p. 480.

Victoria, Ocean Grange, near Sale ; type in coll. Lyell.

211. *Arctornis lutea*.*Bombyx lutea*, Fabr. Syst. Ent. p. 574 (1775).*Artaxa chrysophila*, Walker, xxxii. p. 334 (1865).*Porthesia iobrota*, Meyrick, Trans. Roy. Soc. S. Austr. 1891, p. 194.*Porthesia lutea*, Swinhoe, Trans. Ent. Soc. 1903, p. 395 (note).Type, ♀, in Banksia Cabinet, B.M. ; type, *chrysophila*, Australia, in B.M. ; Queensland, St. Aiguan, Louisiade Isls., N. Guinea.Genus *TOPOMESOIDES*, Strand, in Seitz's Macrolep.  
ii. p. 133 (1912).212. *Topomesoides jonasi*.*Aron jonasi*, Butler, Ann. & Mag. Nat. Hist. (4) xx. p. 402 (1877) ;

Butler, Ill. Het. ii. p. 10, pl. xxiii. fig. 11 (1878).

*Topomesoides jonasi*, Strand, l. c. p. 134.*Ab. gigantea*, Strand, l. c.

Type, ♂, Japan, in B.M.

- Genus *NYGMIA*, Hübner, Verz. bek. Schmett. p. 193  
(1818) ; type, *phæorrhæa*, Don.*Urocoma*, Herr.-Schäff. Aussereur. Schmett. i. p. 82 (1855) ; type,  
*limbalis*, Herr.-Schäff.*Lacipa*, Walker, iv. p. 790 (1855) ; type, *Liparis picta*, Boisd.*Artaxa*, Walker, iv. p. 798 ; type, *guttata*, Walker.*Antipha*, Walker, iv. p. 806 ; type, *costalis*, Walker.*Dulichia*, Walker, iv. p. 809 ; type, *fasciata*, Walker.*Lopera*, Walker, iv. p. 919 ; type, *squamosa*, Walker.*Arua*, Walker, v. p. 1176 (1855) ; type, *apicalis*, Walker.*Somena*, Walker, vii. p. 1734 (1855) ; type, *scintillans*.*Utida*, Walker, xxvi. p. 1689 (1862) ; type, *incomptaria*, Walker.*Cozola*, Walker, xxxii. p. 390 (1865) ; type, *leucospila*, Walker.*Adullia*, Walker, xxxii. p. 394 ; type, *lunifera*, Walker.*Themaca*, Walker, xxxii. p. 395 ; type, *comparata*, Walker.*Orasca*, Walker, xxxii. p. 502 ; type, *subnotata*, Walker.*Bembina*, Walker, xxxii. p. 505 ; type, *apicalis*, Walker.*Microgynna*, Wallgrn. K. Vet.-Akad. Handl. (2) v. (6), p. 38 (1865) ;  
type, *Liparis picta*, Boisd.*Goyana*, Walker, xxxv. p. 1920 (1866) ; type, *atrosquama*, Walker.*Chærotricha*, Felder, Reise Nov. pl. xcviil. Erk. p. 3 (1868) ; type,  
*conspersa*, Felder.*Terphothrix*, Holland, Psyche, vi. p. 474 (1893) ; type, *lanaria*,  
Holland.

213. *Nygmia phæorrhæa*.

*Bombyx phæorrhæa*, Don, Brit. Ins. x. pl. 555 (1801).

Var. *iraniensis*, Staud. Cat. Lep. Pal. Staud. & Rebel, p. 114 (1901).

Ab. *punctigera*, Trich. Corr. Nat. Ver. Riga, xli. p. 87.

Ab. *punctella*, Strand, in Seitz's Macrolep. ii. p. 135 (1912).

Ab. *nigrosignata*, Banderian, Ent. Zeit. xx. p. 97.

Ab. *flavescens*, Rebel, Berge's Schmitt-Buch. p. 116.

Ab. *abdominata*, Strand, in Seitz's Macrolep. ii. p. 135 (1912).

Scandinavia, Livland, Mauretania, Asia Minor, Armenia, Sarafshan District, Japan.

-214. *Nygmia straminea*.

*Euproctis straminea*, Leech, Trans. Ent. Soc. 1899, p. 135; Strand, l. c. pl. xxiii. a.

Type, ♂, Chia-Kow-ho; type, ♀, Omeishan, in B.M.

215. *Nygmia niphonis*.

*Chærotricha niphonis*, Butler, Trans. Ent. Soc. 1881, p. 9.

*Chærotricha squamosa*, Butler, l. c.

*Porthesia raddei*, Staud. Rom. sur Lep. iii. p. 207, pl. xvii. fig. 3 (1887).

*Euproctis raddei*, Strand, l. c. pl. xxi. e, f, in Seitz's Macrolep. ii.

Types, ♂ ♀, Japan, in B.M.; Amur.

216. *Nygmia coreana*.

*Euproctis coreana*, Staud. Rom. sur Lep. vi. p. 311.

Corea.

-217. *Nygmia piperita*.

*Euproctis piperita*, Oberth. Etud. d'Ent. v. p. 35.

Var. *snellens*, Staud. Rom. Mem. Lep. iii. p. 207.

*Euproctis piperita*, Strand, l. c. pl. xxi. e.

Amurland, Japan, S. and W. China.

218. *Nygmia pulvereæ*.

*Artaxa pulvereæ*, Leech, P. Z. S. 1888, p. 623, pl. xxxi. fig. 5.

Types, ♂ ♀, Satsuma, in B.M.; Nagasaki, Loo-Choo Isl., Gensan, Kia-ting-fu.

219. *Nygmia conspersa*.

*Artaxa conspersa*, Butler, Oist. Ent. iii. p. 117 (1882).

*Euproctis conspersa*, Strand, l. c. pl. xxi. f.

Ab. *choka*, Strand, l. c.

Types, ♂ ♀, Japan, in B.M.

220. *Nygmia staudingeri*.

*Chærotricha staudingeri*, Leech, P. Z. S. 1888, p. 624, pl. xxxi. fig. 6.  
*Euproctis staudingeri*, Strand, l. c. pl. xxi. f.

Types, ♂ ♀, Japan, in B.M.

- 221. *Nygmia latifascia*.

*Euproctis latifascia*, Walker, iv. p. 831 (1855), ♀; Strand, l. c. p. 137,  
 pl. xxi. f.

*Euproctis antica*, Walker, iv. p. 835, ♂.

*Euproctis abdominalis*, Moore, P. Z. S. 1883, p. 398, ♂.

*Ab. basiatra*, Strand, l. c.

Types, ♂ ♀, *latifascia* and *antica*, Nepal; type, *postica*,  
 N. India; type, *abdominalis*, Kangra: all in B.M. Sikkim,  
 Bhutan.

- 222. *Nygmia flavinata*.

*Artaxa flavinata*, Walker, xxxii. p. 331 (1865).

*Euproctis flavinata*, Strand, l. c. pl. xxiii. a.

Type, Shanghai, in B.M.; Chusan, Ningpo, Sarawak,  
 Moulmein, Nilgiris, Ceylon.

- 223. *Nygmia recurvata*.

*Euproctis recurvata*, Leech, Trans. Ent. Soc. 1899, p. 138; Strand, l. c.  
 p. 138, pl. xxiii. c.

Type, ♂, Chang-Yang, in B.M.

- 224. *Nygmia sulphurescens*.

*Artaxa sulphurescens*, Moore, P. Z. S. 1883, p. 399.

*Euproctis sulphurescens*, Strand, l. c. p. 137, pl. xxi. h.

Types, ♂ ♀, Kangra, in B.M.; Subathu, Dharmasala,  
 Sultaupore, Sikkim.

- 225. *Nygmia montis*.

*Artaxa montis*, Leech, Entom. xxiii. p. 111 (1890).

*Euproctis montis*, Strand, l. c. pl. xxiii. a.

Type, ♂, Chang-Yang; type, ♀, Chia-kow-ho: both in  
 B.M.

- 226. *Nygmia lunata*.

*Euproctis lunata*, Walker, iv. p. 837 (1855); Butler, Ill. Het. v. p. 50,  
 pl. lxxxix. fig. 9 (1881); Strand, l. c. pl. xxi. g.

Types, ♂ ♀, N. India, in B.M.; Kashmir, Subathu,  
 Kangra, Umballa, Poona, Madras.

-227. *Nygmia cervina*.

*Artaxa cervina*, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 345 (1877).

*Euproctis cervina*, Strand, l. c. pl. xxiii. a.

Var. *kashmirica*, Strand, l. c.

Type, Ceylon, in B.M.; Koni, Shan States; Kashmir.

-228. *Nygmia vitellina*.

*Liparis vitellina*, Kollar, Hügel's Kashmir, iv. p. 471 (1844).

*Euproctis gamma*, Walker, vii. p. 1781 (1856).

*Artaxa princeps*, Walker, xxvii. p. 331 (1866).

*Themaca comparata*, Walker, xxxii. p. 395.

*Euproctis vitellina*, Strand, l. c. pl. xxiii. a.

All Walker's types, N. India, in B.M.; Sikkim, Simla, Murree, Dalhousie, Dharmasala, Kangra, Sutanpore, Kashmir.

-229. *Nygmia plana*.

*Euproctis plana*, Walker, vii. p. 1731 (1856).

*Chærotricha plana*, Butler, Ill. Het. v. p. 51, pl. lxxxix. fig. 13 (1881).

*Euproctis discinota*, Moore, P. Z. S. 1877, p. 601.

*Euproctis plana*, Strand, l. c. pl. xxi. g.

Type, Darjiling; type, *discinota*, Andamans: both in B.M. Burma, Khasia Hills.

-230. *Nygmia icilia*.

*Bombyx icilia*, Stoll, Suppl. Cramer, p. 158, pl. xxxv. fig. 5 (1791).

*Chærotricha decussata*, Moore, Ann. & Mag. Nat. Hist. (4) xx. p. 347 (1877).

*Euproctis icilia*, Strand, l. c. pl. xxii. g.

Type, *decussata*, Ceylon, in B.M.; Bombay, Poona, Karwar, Travancore, Malabar.

-231. *Nygmia numensa*, nom. nov.

*Pida albodentata*, Moore, P. Z. S. 1879, p. 401 (præocc.).

Type, ♀, N.W. Himalayas, in B.M.; Burma.

-232. *Nygmia bipunctapex*.

*Somena bipunctapex*, Hmps. Ill. Het. viii. p. 57, pl. cxl. fig. 13 (1891).

*Euproctis bipunctapex*, Strand, l. c. pl. xxi. h.

Type, Nilgiris, in B.M.; Kangra, Kashmir, Burma, Khasia Hills, Singapore, China.

-233. *Nygmia varians*.

*Artaxa varians*, Walker, iv. p. 796 (1855).

*Artaxa pygmaeu*, Moore, Lep. Atk. p. 48 (1879) (præocc.).

*Artaxa pusilla*, Moore, Lep. Ceylon, ii. p. 86, pl. cxii. fig. 4 (1883).

All types, in B.M., common in many parts of India, Ceylon, and China; Formosa.



484 *A Revision of the Genera of the Family Liparidæ.*

234. *Nygmia argentata*.

*Euproctis argentata*, Leech, Trans. Ent. Soc. 1890, p. 139; Strand, l. c. pl. xxiii. b.

Type, ♂, Japan, in B.M.

235. *Nygmia fasciata*.

*Dulichia fasciata*, Walker, iv. p. 809 (1855).

*Artaxa squamiplaga*, Walker, Proc. Nat. Hist. Soc. Glasgow, i. p. 338 (1860).

*Euproctis susanna*, Staud. Iris, vii. p. 258, pl. ix. fig. 9 (1894); Strand, l. c. pl. xxi. c.

*Euproctis torrida*, ♂, Distant, Ann. & Mag. Nat. Hist. (6) xx. p. 202 (1897).

*Euproctis stellata*, ♀, Distant, l. c.

*Euproctis fasciata*, var. *ampla*, Beth.-Baker, Ann. & Mag. Nat. Hist. (8) vii. p. 543 (1911).

Type, Sierra Leone; type, *squamiplaga*: both in B.M. Type, *susanna*, in Berlin Mus.; types, *torrida* and *stellata*, in coll. Distant; type, *ampla*, near Dalla Tondo, in coll. Beth.-Baker. Natal, Zululand, Old Calabar, Aden, Palestine.

-236. *Nygmia chinensis*, nom. nov.

*Euproctis unipuncta*, Leech, Trans. Ent. Soc. 1890, p. 136 (præocc.); Strand, l. c. p. 138, pl. xxiii. b.

Types, ♂ ♀, W. China, in B.M.

237. *Nygmia digramma*.

*Bombyx digramma*, Guérin, Icon. R. Anim. Ins. p. 508, pl. lxxxvi. fig. 4 (1830).

*Artaxa unimacula*, Moore, P. Z. S. 1879, p. 399.

Type, *unimacula*, Khasia Hills, in B.M.; Nepal, Hongkong, Bhutan, Shan States, Burma, Sumatra, Java, Ceylon.

238. *Nygmia sastra*.

*Artaxa sastra*, Moore, Cat. Lep. E. I. Co. ii. p. 351 (1859).

Type, ♂, Java, in B.M.

239. *Nygmia incommoda*.

*Artaxa incommoda*, Butler, Cist. Ent. iii. p. 11 (1882).

Type, ♂, Madagascar, in B.M.

240. *Nygmia commutanda*.

*Euproctis commutanda*, Swinhoe, Trans. Ent. Soc. 1903, p. 412.

*Arva immaculata*, Butler, Ann. & Mag. Nat. Hist. (5) x. p. 227 (1882) (præocc.).

Type, Duke of York Island, in B.M.

[To be continued.]

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LI.—*Notes on African Non-marine Mollusca, with  
Descriptions of many new Species.* By M. CONNOLLY.

[Plate XIV.]

IN the years just previous to 1914 an enormous amount of material of the highest conchological importance was sent home from Tropical Africa by Messrs. A. Blayney Percival, Robin Kemp, and C. W. Woodhouse. Some of the results of their labours were published by H. B. Preston in a series of short papers on a wide range of genera, culminating in two longer articles specializing the Streptaxidæ and Zonitidæ of that part of the Continent.

It is common knowledge that much further work was in contemplation by the same author on the Stenogyridæ and other families; descriptions and even figures of many new species had been prepared and were ready for press, when sundry world-wide disturbances delayed publication, which it has hitherto been impossible to resume.

It has now been my good fortune to acquire from Mr. Preston the whole collection of over 300 shells selected by him as types of the unpublished species, and I propose to deal with these and a few from other sources in the following series of papers.

As early publication was expected, many paratypes were distributed by Preston before the war and find place in  
*Ann. & Mag. N. Hist.* Ser. 9. Vol. x. 33

public and private collections under manuscript names, more than one of which has already appeared in print and one, at least, in synonymy. I have, therefore, thought it advisable to retain, as far as possible, the names originally suggested by Preston, but, with his full approval, in order to avoid the clumsy system of joint or sponsored nomenclature, I accept all responsibility for authorship, while tendering to Mr. Preston most grateful thanks for his initiative and assistance.

One or two species, however, originally distributed by him as new, have since, from various causes, proved to be invalid and may escape notice altogether in these pages. If, therefore, on the conclusion of my articles, any collector finds himself in possession of a species bearing a manuscript name bestowed by Preston and unmentioned by myself, I will be glad to inform him as to the reason of its non-publication if he will communicate with me on the subject.

Except where otherwise specified, the types of all the new species are at present in my collection.

The frequent allusions to Pilsbry's arrangement refer, for the most part, to that adopted by him in his "Review of the Land Mollusks of the Belgian Congo" (Bull. Amer. Mus. N. H. xl. 1919).

### Family Streptaxidæ.

#### Genus TAYLORIA, Bourguignat, 1889\*.

Bourguignat founded this genus for two species, *Zonites ventrosa*, Gibbons, and *Tayloria jouberti*, Bgt. I cannot find that the genotype has ever been fixed, and therefore nominate *T. jouberti* for that position. Bourguignat probably never saw *ventrosa*, for it was founded on a single specimen, which appears to be lost, and I believe that no others are known; it is a very small shell, less than  $4\frac{1}{2}$  mm. in diameter, and may not belong to the genus.

On the other hand, *T. jouberti* appears to be one of the group of Zonitoid African Streptaxidæ, some of which are well illustrated by Preston† and are apparently closely allied to the South American genus *Artemon*, Beck.

*Artemonopsis*, Germain, 1908‡, founded for a small West African species, appears to be a synonym of *Tayloria*.

\* Moll. de l'Afr. équat. p. 38.

† P. Z. S. London, 1913, pl. xxxii. figs. 1-3.

‡ Bull. Mus. Paris, xix. p. 124, and J. de C. lvi. p. 98.

The genus includes the following :—

*Streptaxis* (*Artemonopsis*) *chevalieri*, Germain, 1908.

„ *desiderata*, *marsabitensis*, and *urguessensis*,  
Preston, 1913.

*Gonaxis helicoides*, C. Boettger, 1913.

*Rhytida hyalinoides*, Thiele, 1911.

*Tayloria iterata*, von Martens, 1897.

„ *jouberti*, Bourguignat, 1889.

*Helix usambarica*, Craven, 1880.

*Zonites ventrosa*, Gibbons, 1877.

From examination of the radulæ of *hyalinoides*, *usambarica*, and *urguessensis*, Thiele\* considers that the genus has closer affinity with the Paryphantidæ than with the Streptaxidæ.

*Tayloria shimbiensis*, sp. n.

Shell of fair size, depressedly turbate, perforate, thin, silky, semitransparent, olivaceous. Spire but little raised, though each whorl is plainly visible in profile above the next; apex obtuse. Whorls  $5\frac{1}{2}$ , not very convex, regularly and rather rapidly increasing, the last rounded at the periphery, the first  $1\frac{1}{4}$  microscopically, mallearly punctate, remainder sculptured above with very close, regular, raised, curved, oblique, transverse striæ, which almost disappear at the periphery and are hardly visible on the polished base; suture simple, well defined. Aperture sublunate, oblique, slightly descending; peristome narrowly reflexed; columella very weak; umbilicus very broad and deep; callus and dentition none.

Diam. maj. 15·8, min. 14·3; alt. 9·3; apert., alt. 6·8, lat. 7·2 mm.

*Hab.* KENYA, Shimbi Hills (*Kemp*).

This species appears to differ from *helicoides* in being flatter and more strongly sculptured above, and from *iterata*, *marsabitensis* and *urguessensis* in being considerably less highly sculptured beneath, while *chevalieri*, *desiderata* and *hyalinoides* are described as smooth and glossy on the upper as well as the under side of the shell; *usambarica* is an altogether larger form.

\* D. Zentr.-Afr.-Exp. 1911, p. 187, and Arch. f. Molluskenkunde, 1921, p. 156.

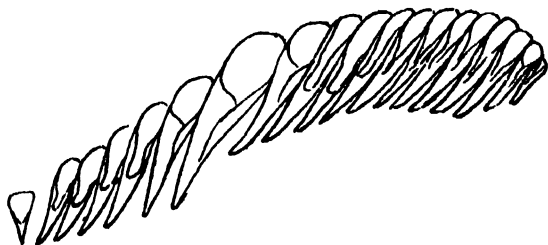
## Genus MARCONIA, Bourguignat, 1889.

*Marconia latula* (Mts.), 1895.

Figs. 49 & 50 on Pl. XIV. illustrate two paratypes in the British Museum, from Butumbi and Migere respectively; fig. 58 is that of a shell collected by Kemp near Lake Mutanda, which Preston, perhaps rightly, considered a distinct species and intended to name in accordance with its egg-like form. In view, however, of the great variation in length and relative breadth which occurs in species of this genus, I hesitate to regard it as other than an obese, rather senile example of *M. latula*.

*Marconia margarita* (Preston), 1913.

A small series collected by A. O. Fisher near Fort Portal appear inseparable, on conchological grounds, from this species, of which a paratype is illustrated in fig. 51. They vary in size from  $13.3 \times 7.5$  to  $15.8 \times 9.5$  mm., the two largest being depicted in figs. 59 & 60.



*Marconia margarita* (Preston). Half of one row of radula,  $\times 53$ .

It will be seen that there is practically no difference in aspect between the shells of *M. latula* and *M. margarita*, and I would have united them without hesitation, were it not for the fact that the radula extracted by Colonel Peile from more than one of the Fort Portal series differs so considerably from that of *latula*, as described by Thiele, that, if the shells are rightly identified and the radulae normal, they cannot possibly be conspecific.

The animals from Fort Portal were yellowish green, and imparted their hue to the water in which the shells were soaked previous to their extraction. The radula, of which Colonel Peile has kindly furnished the subjoined drawing (see text-fig.), has a small median tooth; the admedians are

18 in number, increasing in size from 1 to 6, which is the largest, and diminishing thence to 10; 10 to 16 subequal, 17 rather smaller than 16, 18 the smallest. Number of rows, including nascent, 54.

*Marconia elgonensis* (Preston), 1913.

It has not been possible to examine the radulæ, but, judging from the shells alone, this species appears to be widely distributed to the north and east of L. Victoria Nyanza, having been collected on Mt. Elgon (*Woodhouse*), the Uasin Gishu Plateau (*Mrs. Barber*), Malange, Mabira Forest (*Dummer*), and the Darugu River Valley (*Harries*). The animal resembles in colour that of *M. margarita*.

While varying little in form, this species shows enormous variation in size, especially at a distance from the type-locality, in the Darugu R. valley, where examples range from 10½ up to 15 mm. in length, while in the Cedar Forest on the Uasin Gishu Plateau, on the eastern slope of Mt. Elgon, the average length is rather smaller than that of the type, being only 9 mm.

The gradual and regular range in size is shown in a series from various districts in figs. 43 to 48 and 52 to 57 on Pl. XIV., among which may also be observed a marked difference in comparative width between examples from the same locality, the lower sutures being noticeably more oblique in the more slender shells.

Genus PTYCHOTREMA, Mörch, 1852.

*Ptychotrema fisheri*, sp. n. (Pl. XIV. fig. 32.)

Shell comparatively large, cylindrical, rimate, rather solid and silky, semitransparent, pale lacteous-olivaceous. Spire produced, sides nearly parallel, apex hemispherical. Whorls 8, nearly flat, first 4 rapidly increasing, remainder nearly equal, sculpture consisting of oblique transverse striæ, extremely close and faint on the first 4 whorls, more distant and much stronger, especially below the suture, on the remainder; suture shallow, subcrenulate. Aperture quadrate, narrowing at base; peristome continuous, white, shining, broadly reflexed; dentition consisting of a strong fold at the angle of paries and sinus, concave on its right and entering as far as can be seen within the shell; opposite this is a single supra-palatal denticle, below which is a large inrunning fold, corresponding to a deep external furrow

which extends nearly round to the columellar margin ; a more deep-set fold on the right of the base, corresponding to a similar, but smaller, external furrow ; two small denticles midway up the inner columellar margin, which are duplicated by two similar, but quite separate, denticles deep within the shell, high up on the columella, while above the latter, commencing slightly nearer the surface, is a narrow, but prominent, inrunning fold on the left of the paries. Callus so thick as to make the peristome continuous ; rima long, narrow, and shallow.

Long. 15·4, lat. 5·8 ; apert., alt. 2·8, lat. 2·0 ; last whorl, 7·0 mm.

*Hab.* UGANDA, near Fort Portal (*Fisher*).

Type in Coll. Peile.

It seems extraordinary that this fine species has not been discovered before in such a frequently explored neighbourhood, but I can find nothing very like it among species hitherto described ; one of its most distinctive features is the duplicated columellar dentition. I have much pleasure in dedicating it to its finder, whose researches promise to furnish results of great value.

#### Section PARENNEA, Pilsbry, 1919.

##### *Ptychotrema (Parennea) cedrorum*, sp. n. (Pl. XIV. fig. 13.)

Shell minute, subovate, rimate, thin, subasperate, somewhat bleached in the type, but normally probably olivaceous. Spire produced, sides slightly convex, apex rounded. Whorls 6, convex, gradually increasing, the first 2 smooth, remainder sculptured with close, regular, well-defined, rather wavy, vertical striae, which are far fainter and slightly oblique on the third whorl ; suture simple, deep. Aperture nearly heart-shaped ; peristome slightly expanded, white, continuous ; columella weak, rima deep ; dentition consisting of a deeply entering lamella on the right centre of the paries, which is sinuate at that point, and a prominent inrunning ridge-like fold in the centre, but not reaching the margin, of the outer lip, corresponding to a deep external spiral furrow extending halfway round the body-whorl.

Long. 2·8, lat. 1·5 ; last whorl 1·2 mm.

*Hab.* KENYA, Cedar Forest, Uasin Gishu Plateau, 8500 ft. (*Mrs. Barber*).

Type in Albany Museum, Grahamstown.

Obviously near akin to *P. æquatoriale*, Pilsbry, from the Ituri Forest, Belgian Congo. The last-named, however, is typically a larger form, 3.6 mm. in length, with apparently more distant striæ, while the palatal fold terminates in a conspicuous denticle on the outer lip, a feature entirely lacking in the new species, in which, moreover, the parietal lamella is situated nearer the centre of the paries and none of the dentition is of sufficient prominence to be noticeable in the photographic figure.

Genus GULELLA, Pfeiffer, 1856.

*Gulella hitzeensis*, sp. n.

Shell comparatively large, rimate, elongate-oval, thin, smooth, glossy, transparent, pale olivaceous. Spire produced, sides slightly and regularly convex, apex rounded. Whorls 5, flattish, regularly increasing, protoconch sparsely microscopically malleate, and all but the apical whorl sculptured with extremely faint, oblique, transverse striæ; suture simple, shallow. Aperture nearly triangular, narrowly rounded at base; peristome white, shining, broadly reflexed; columella long and straight, rima long and shallow; callus faint; dentition as follows:—a large lamella, incurved on the right and hooked to the left, at the junction of paries and outer lip (in the type there is no other parietal process, but a mid-parietal denticle is present in the generality of specimens); a large square tooth, showing slight trace of bifidity, arising from a small external cavity, halfway down the outer lip, with a small sharp denticle above, midway between it and the paries; a minute mid-basal denticle and two large, narrow, horizontal columellar teeth, the lower of which enters deeply with a slight curve, the upper straight and only shortly entering.

Long. 11.3, lat. 6.2; apert., alt. 4.0, lat. 3.7; last whorl 6.8 mm.

This species forms one of a group with *G. cavidens* (Mts) and *acutidens* (Bttg.), the three being distinguishable as follows:—

*G. cavidens*: the upper columellar denticle is very small and situate on the extreme edge of the inner margin of the columella; the lower columellar tooth or fold is rather deeply entering from the edge inwards and slightly downwards, curved into a hollow on its upper side; the lower tooth on the outer lip is nearly square; the shell examined measures 13.0 × 6.6 mm.



*G. acutidens*: the upper columellar denticle is slightly more removed from the margin, and the lower only enters a very short distance and is acute, not hollow; the two teeth on the outer lip are closer together than in *cavidens* and the lower is acute, not square; the shell examined measures 11.0 × 6.1 mm.

*G. bilzeensis*: the upper columellar denticle is more prominent than in either of the foregoing, equally inset with that of *acutidens*; the lower enters deeply but less downward than in *cavidens*; the teeth on the outer lip are as in *cavidens*.

*Gulella cancellata*, sp. n. (Pl. XIV. fig. 36.)

Shell of moderate size, perforate, cylindriform, semi-transparent, glossy with a silky sheen, pale olivaceous. Spire produced, sides parallel, apex flatly mamillate. Whorls 6½, convex, first 3½ rapidly increasing, last 3 almost equal; the first 2 whorls extremely faintly, closely, microscopically, transversely striate, with very faint, fine, rather distant spiral striæ commencing towards the end of the 2nd whorl, where there are about 8 visible, and continuing on the remainder, cutting through the close, fine, curved, oblique transverse striæ which cover the last 3½ whorls; suture simple, impressed. Aperture quadrate; peristome white, shining, reflexed; columella straight, rima pronounced; callus white and thick; dental process five-fold; a strong incurved lamella at the junction of paries and outer lip; 2 well-defined teeth on the outer lip, arising from one broad base which corresponds to a small external depression; a rather smaller tooth, corresponding to a minute external depression, on the centre of the base, these 4 teeth being nearly equidistant; and a strong sharp fold, with a downward slant, about two-thirds way up the columella.

Long. 6.5, lat. 3.0; apert., alt. 2.0, lat. 1.2; last whorl 3.5 mm.

Var. *ex forma minor*. (Pl. XIV. fig. 37.)

Resembles the type in all external features, but contains only 5 whorls and is considerably smaller, measuring:

Long. 4.3, lat. 2.2; apert., alt. 1.2, lat. 0.9; last whorl 2.6 mm.

*Hab.* KENYA, Larogi Hills (*Percival*).

A beautiful species, noticeable for its criss-cross sculpture and very regular dentition. *G. lima* (Preston), which has

somewhat similar sculpture, has a double tooth on the columella.

*Gulella candela*, sp. n. (Pl. XIV. fig. 28.)

Shell very small, cylindrical, perforate, smooth, glossy, nearly transparent, pale milky olivaceous. Spire produced, sides parallel, apex mamillate. Whorls 6, first 2 rapidly increasing, remainder nearly equal; the sculpture, which is hardly visible under a microscope except on the last 3 whorls, consists of faint, rather close, slightly curved and oblique, transverse striæ, strongest just below the suture, which is simple and rather shallow, though well defined. Aperture subquadrate; peristome white, shining, reflexed; columella straight, rima deep; callus pronounced; dental process four-fold:—a prominent inrunning lamella at the junction of paries and outer lip; a very large triangular tooth on the outer lip, corresponding to a deep external cavity with 4 or 5 strong puckers behind it; a small tubercle to the left of the base and a broad blunt fold deep-set on the columella.

Long. 4·3, lat. 1·4; last whorl 1·9 mm.

*Hab.* KENYA, Taru Desert (*Percival*).

*Var. ex forma minor.*

Similar to type, but containing only  $5\frac{1}{2}$  whorls and considerably smaller, measuring: long. 3·3, lat. 1·2; last whorl 1·5 mm. It occurs in the same district, but has not yet been found in company with the type.

This little species resembles in shape and size *G. gwendolinæ* and *G. foveolata* (Preston). In *gwendolinæ*, however, there is a double columellar tooth and 2 clear teeth on the outer lip, while in *foveolata* there are 2 basal denticles, and the tooth on the outer lip has an upper cusp, with which the parietal plait interlocks.

*Gulella pisa*, sp. n. (Pl. XIV. fig. 21.)

Shell very small, elongate, imperforate, rather solid, semi-transparent, pale milky olivaceous. Spire produced, very slightly inclined to the right, apex rounded. Whorls 6, nearly flat, regularly and very slowly increasing, the first smooth, remainder sculptured with close, strong, straight, regular, vertical rib-striæ, fainter and closer on the 2nd than on the succeeding whorls; suture simple, rather deeply

impressed, increasing in obliqueness with each whorl. Aperture irregular, peristome thickened, slightly reflexed at the base and more so on the columella, but not forming a rima; outer lip strongly curved outward and forward below the suture, and then considerably incurved before descending almost vertically to the base; dental process three-fold:—a broadly rounded, rather deep-set protuberance high on the columella; a small, sharp mid-parietal plait and a broad, bluntly pointed swelling, corresponding to a deep external depression, on the inward curve of the outer lip; there is a slight callus.

Long. 3·4, lat. 0·9; apert., alt. 1·0, lat. circa 0·4; last whorl 1·5 mm.

*Hab.* KENYA, Eusso Nyiro (*Kemp*).

A beautiful little species with the form of a *Raffraya*, but the dentition of a *Gulella*. It was distributed by Preston under a Latin name recalling its resemblance to a column, which is too near that of other species to be retainable. It differs from the figure of *G. filicosta* (Morelet) in its parietal plait pointing downwards to the right instead of to the left, and its columellar fold being deep-set at the upper angle of the columella, whereas in *filicosta* it is situate halfway up near the margin.

*Gulella impedita*, sp. n. (Pl. XIV. fig. 33.)

Shell very small, acuminate-ovate, rimate, thin, silky, pale olivaceous. Spire moderately produced, sides convex, with the greatest circumference at the 6th whorl, apex bluntly rounded. Whorls  $7\frac{1}{2}$ , rather convex, very slowly increasing, the first  $2\frac{1}{2}$  smooth, remainder sculptured with regular, rather close, slightly oblique liræ, curved on the 3rd and sinuous on the later whorls, very slightly more distant on each succeeding whorl, about 23 being visible from the front of the 6th; suture simple, impressed. Aperture subreniform; peristome reflexed, white, continuous, slightly angulate at the meeting of paries and columellar margin; columella concave, rima deep; dentition consisting of an incurved lamella on the right centre of the paries, which merges from that point into the sinus; a triangular tooth, pointed at its upper extremity, corresponding to a deep and lengthy external depression, at the base of the sinus; and a broad fold, ridged and bluntly pointed, too deep-set on the columella for its full details to be perceptible; the basal tooth is represented by an inconspicuous inrunning ridge,

corresponding to a pronounced external crease, on the left of the base.

Long. 3·1, lat. 1·8; apert., alt. 0·8, lat. 0·6; last whorl 1·5 mm.

*Hab.* KENYA, Kekumega (*Percival*).

A rather ordinary little species of the strongly sculptured group with conical apex, but differing in its small round aperture and dental process from any of its fellows.

*Gulella calva*, sp. n. (Pl. XIV. fig. 35.)

Shell small, rimate, shuttle-shaped, thin, asperate, bleached in the type, but normally semitransparent and pale olivaceous. Spire produced, the four apical whorls and the base conical, forming nearly equal triangles, intermediate whorls almost parallel, apex mamillate. Whorls 8, very convex, almost equal in vertical measurement, the first 5 increasing rapidly and remainder equal in diameter; the first 3 smooth, remainder covered with strong, regular, nearly straight, vertical costæ, further apart on the 5th and 6th whorls, about 12 being visible from the front on the 6th, and 16 on the 7th; suture simple, very deep. Aperture triangular, rather narrowly rounded at base; peristome expanded, columella straight, slightly inclined to the left, rima long and deep; callus none; dentition consisting of a rather deep-set, bluntly pointed columellar fold; a slightly incurved lamella at the angle of paries and sinus; a rather large, triangular, pointed tooth on the outer lip, corresponding to a single exterior depression and bearing an inconspicuous cusp rather nearer the surface on its upper slope; and a very small, more deeply set denticle below the large tooth, on the right extremity of the base.

Long. 4·5, lat. 2·1; apert., alt. 1·2, lat. 1·1; last whorl 1·9 mm.

*Hab.* KENYA, Taru Desert (*Percival*).

*Gulella filix*, sp. n. (Pl. XIV. fig. 12.)

Shell minute, ovate, rimate, asperate, pale olivaceous. Spire produced, sides slightly convex, apex bluntly rounded. Whorls 7, extremely convex, the first 2, which form the protoconch, smooth and rather disproportionately large, remainder increasing very gradually in size, sculptured with very strong, regular, rather curved, nearly vertical costæ, much closer on the 3rd than on the later whorls, there being

about 11 visible on the front of the 6th whorl; suture simple, deeply incised. Aperture irregularly three-sided; peristome expanded, the ends joined by a thick callus; columella concave, rima small; dentition consisting of a moderate-sized lamella at the junction of paries and sinus; a rather large, pointed, triangular tooth on the outer lip with a small cusp or projection on its upper slope, and a broad, flat, extremely deep-set fold on the columella.

Long. 2·7, lat. 1·3; last whorl 1·2 mm.

*Hab.* KENYA, Cedar Forest on Uasin Gishu Plateau, 8500 ft. (*Mrs. Barber*).

A minute species, whose convex whorls rather resemble the fronds of a fern.

The type is in the Albany Museum, Grahamstown.

*Gulella prestoni*, nom. nov.

1910. *Ennea delicatula*, Preston, Ann. & Mag. Nat. Hist. (8) vi. p. 528.

As Pfeiffer bestowed the name *delicatula* on a South African shell in 1857, Preston's species must be renamed, and I have much pleasure in dedicating it to its author. Both species appear to belong to the genus *Gulella*, s. s.

*Gulella disseminata* (Preston), 1913.

1913. *Ennea disseminata*, Prest. P. Z. S. p. 202.

1913. *Ennea ingeziensis*, Prest. *ibid.* p. 204.

1913. *Ennea burungaensis*, Prest. *ibid.* p. 206.

I have not been able to inspect the types, but several paratypes of the three species above quoted have been available for examination and I have no hesitation in uniting them. The appropriate name *disseminata* takes precedence, and the other two do not seem to me worthy of even varietal rank.

*Gulella disseminata kekumegaensis*, subsp. n.

(Pl. XIV. fig. 14.)

Differs from the typical form through greater comparative width in proportion to its height and in its sculpture, which is almost non-existent on the face of the whorls, but peculiarly strong in the crenulate sutures. The shell contains 6 whorls and measures: long. 3·8, lat. 1·7; apert., alt. 1·1, lat. 0·9; last whorl 2·2 mm.

*Hab.* KENYA, Kekumega (*Percival*).

The locality, north-east of L. Victoria Nyanza, is rather

remote from that of *disseminata* in the extreme south-west of Uganda, and larger series may ultimately prove the two forms to be specifically distinct.

*Pupilla fontana* (Krauss) and *Ennea iredalei*, Preston.

*E. iredalei*, of which I have examined paratypes, appears to have been founded on a large bleached example of *P. fontana*. It represents almost the largest form of the latter, and may be attributable to one of the so-called "species" evolved therefrom by Bourguignat; however, nearly every variation of size and dentition may be met with together in some parts of South Africa, and I agree with Pilsbry (Manual, 1921) in placing all the North and South African forms of the *fontana* group under one name.

A smaller example of this species was collected by Percival between the Laikipia Plateau and Eusso Nyiro.

Section PAUCIDENTINA, von Martens.

*Gulella* (*Paucidentina*) *dupuisi*, sp. n. (Pl. XIV. fig. 39.)

Shell of fair size, cylindric-ovate, rimate, thin, smooth, glossy, transparent, pale olivaceous. Spire produced, 4 apical whorls convexly conic, remainder nearly parallel, apex rounded. Whorls 7, rather convex, slowly increasing, smooth except for extremely faint transverse striæ, which are only visible with a strong lens just below the suture of the later whorls, where they form a faint beading, and for a short distance behind the outer lip; suture filiform, not crenulate. Aperture triangular, with equal sides and rounded angles; peristome white, very slightly thickened and expanded, outer lip clearly angulate in profile, in contrast with the nearly straight striation; columellar margin strongly inclined to the left; rima deep; callus none; dentition consisting of a short sharp denticle on the right centre of the paries; a smaller one, without any external depression, at the angle of the outer lip; and a broad flat plate, extending from the left of the base along two-thirds of the inner columellar margin, with a small swelling or tubercle at each end.

Long. 8.0, lat. 3.9; apert., alt. 2.2, lat. 1.8; last whorl 3.7 mm.

*Hab.* BELGIAN CONGO, Nsendwe (*Dupuis*).

A considerable series of this species shows very little variation; the length ranges from 8.5 down to 7.1 mm. and the dentition is practically constant except in one example,

in which there is a small extra tubercle just above the tooth on the outer lip. *G. dupuisi* bears close resemblance to *G. monodon* (Morelet) (= *conica*, Mts.) and *G. monodon zariaensis* (Preston), but these have no dental process on the columella and a small tubercle, rather than a tooth, on the inflexion of the outer lip. *G. polloneriana*, Pilsbry, and the other members of its group differ clearly by the presence of an angular parietal lamella and more pronounced columellar dentition.

I have much pleasure in dedicating the new species to its finder, Major Paul Dupuis, the pioneer of our recently extended knowledge of Congo mollusca. The type is in his collection.

Section PUPIGULELLA, Pilsbry, 1919.

*Gulella* (*Pupigulella*) *pupa* (Thiele) and  
*Gulella* (*Pupigulella*) *pupa ituriensis*, Pilsbry.

A new and unexpected locality for both the above is CAMERUN, Bitze (*Bates*).

Of two shells from Bitze now before me, the smaller seems to agree with Thiele's figure of *G. pupa* in all respects except the aperture, which is less oblique, and in its rather smaller dimensions,  $4.8 \times 2.6$  mm. with half a whorl less than the figured example from Butumbi, Belgian Congo.

I am quite unable to separate the larger shell from Bitze from Pilsbry's description and figure of his subspecies *ituriensis*; it agrees in length,  $5\frac{1}{2}$  mm., and number of whorls with the quoted dimensions of a specimen from Medje.

My two shells differ noticeably in sculpture, which may be described as ordinary and regular, though closer on the last than on the penultimate whorl, in the typical form, while in *ituriensis* it is coarser and more oblique on the 3rd and 4th, and almost obsolete on the front of the last whorl, except for showing very strongly near the crenulate suture.

If my identification of the two forms is correct, and the difference in sculpture is constant, it should be quite sufficient to establish them as distinct species.

Section PLICIGULELLA, Pilsbry, 1919.

*Gulella* (*Plicigulella*) *sambourouensis* (Dautzenberg), 1908.

This name has been somewhat overlooked by British authorities, examples attributable to it having been usually

distributed as *vicina*, Smith. The two species are very near akin, but their localities are very distant, and, as the two names are in existence, it may be advisable to maintain *vicina* for the Nyasaland race and *sambourouensis* for that which inhabits Kenya Colony.

The striation of *vicina* is extremely fine and close, almost smooth, and the dentition consists of a minute mid-parietal denticle; a strong lamella, slightly hollowed on its right, at the angle of paries and outer lip; three very irregular teeth on the outer lip, arising from a broad flat base corresponding to a single exterior cavity; three close basal denticles, nearly equal in size, of which the two on the right are sometimes more deep-set and sometimes about level with that on the left; and a conspicuous three-pronged columellar fold.

It hails from NYASALAND, Mt. Chiradzulu; Zomba (*Johnston*).

In *G. sambourouensis* the striation is infinitesimally stronger and the sides of the spire more inclined to convexity. The parietal lamella has a tendency to incurvation on its left; the two right-hand basal denticles are, typically, considerably more deep-set than that on the left, and there is usually a most minute additional tubercle on the columella, just below the three-pronged fold, which I have been unable to find in any specimen of *vicina* from Nyasaland.

*Hab.* KENYA, Sambourou (*Alluaud*), Voi (*Feather*), Laikipia Plateau (*Kemp*).

*Gulella (Plicigulella) salutationis*, sp. n. .  
(Pl. XIV. fig. 38.)

Differs from *G. vicina* in its smaller size and comparatively more slender form; its sculpture, moreover, is far fainter, being entirely non-existent save for a few faint, irregular, curved, oblique growth-lines. The dentition of the only two specimens collected is as described above for *vicina*; there is no sign of the small tubercle below the triple columellar fold. The shell contains  $5\frac{1}{2}$  whorls and measures: long. 5.1, lat. 1.4; apert., alt. 1.7, lat. 0.9; last whorl 3.2 mm.

*Hab.* TANGANYIKA, Dar-es-salaam (*Connolly*).

This may eventually prove to be but a subspecies when further series are collected, but its locality is rather remote, and it differs far more from either *sambourouensis* or *vicina* than they do from each other.



*Gulella (Plicigulella) perlata*, sp. n. (Pl. XIV. fig. 34.)

Shell very small, rounded-ovate, rimate, thin, glossy, translucent, milky olivaceous. Spire rather short, sides slightly convex at the 4th whorl, apex bluntly rounded. Whorls 5, rather flat, the 2 apical faintly microscopically malleate, remainder gradually increasing, sculptured with fine, fairly close and regular, nearly straight, moderately oblique transverse striæ, almost obsolete on the front of the body-whorl except in the suture, which is crenulate and shallow, but well defined. Aperture irregular; peristome white, shining, reflexed; columella concave, rima pronounced; dentition most complicated, consisting of a large, incurved, somewhat oblique lamella at the junction of paries and outer lip; a sharp, well-defined, mid-parietal denticle; a large tooth, corresponding to a single deep external cavity, arising just below the small sinus and occupying almost the whole length of the outer lip, with 4 distinct cusps, 2 on the upper slope opposite the parietal lamella and 2, less prominent, at each extremity of the broad projection to the left; just below this, deeply inset, are 2 smaller denticles, the left and lower of which occupies the centre of the base; on the left of the base and nearer the surface is a larger denticle, and above this a deep-set, but prominent, three-fold columellar plait.

Long. 3·7, lat. 2·2; apert., alt. 1·2, lat. 1·0; last whorl 2·2 mm.

*Hab.* KENYA, Kekumega (*Percival*).

A beautiful little species, resembling *G. woodhousei* (Preston) in dentition, but easily recognisable by its shorter broader form.

## Section MOLARELLA, nov.

As Pilsbry has created the section *Plicigulella* for species bearing a three-pronged fold on the columella, it may be convenient to apply the name *Molarella* to the group in which the principal columella process is twofold, usually resembling a prominent, two-cusped, molar tooth, though in individual specimens the cusps may not develop, and in certain species the molar may be divided into the appearance of two single teeth.

The group is easily distinguishable, and contains the following species examined by me: *G. consanguinea* (type), *curvilamella* and *ugandensis* (Smith), *usambarica* (Craven), *coiosa*, *optata*, *lima*, *junerea*, and *gwendolinæ* (Preston).

Judging from the figures, it should also include *G. brevis* (Thiele) and *careia, iridescens*, and *malasangiensis* (Preston), while *G. caroli* (Kob.) is described as possessing a double tooth on the upper portion of the columella, although there is no sign of this feature in the figure of the shell.

*Gulella (Molarella) gwendolinæ scissidens*, subsp. n.  
(Pl. XIV. fig. 27.)

The typical form of *G. gwendolinæ* contains about 6 whorls, is perfectly smooth, with simple, shallow suture, and measures from 5 to  $5\frac{1}{2}$  by  $1\frac{1}{2}$  mm. The dentition consists of an angular parietal lamella; 2 separate, nearly equal, single teeth on the outer lip, corresponding to a single external cavity; a mid-basal denticle, and a large molar tooth, with two well-defined cusps, on the columella. It is known from the Shimbi Hills and Gazi, Kenya Colony.

*G. gwendolinæ scissidens* also contains  $5\frac{1}{2}$  whorls, but is somewhat smaller than type; it is similar in sculpture, suture, parietal lamella, and mid-basal denticle, but differs very noticeably in the columellar molar, which is split to its base, while on the outer lip is a large pointed upper tooth, bearing a minute second cusp on its upper surface, and a smaller, more deep-set lower tooth at the right extremity of the base.

Long. 4.1, lat. 1.6; last whorl 2.0 mm.

*Hab.* TANGANYIKA, Dar-es-salaam (Connolly).

The single example taken differs so considerably from typical *gwendolinæ*, both in size and dentition, that it will be fully entitled to rank as a distinct species if the variation proves to be constant. The localities, however, are not very remote, and I should not be surprised if further search along the coast were to produce intermediates, linking the two forms.

Genus *STREPTOSTELE*, Dohrn, 1866.

In 1919 Pilsbry gave a list of 36 species known to him as belonging to the genus *Streptostele*. In addition to these, I have satisfied myself, from examination of the shells themselves or the literature concerning them, that the following species, hitherto attributed to other genera, should be placed in that genus:—

*Opeas terebra* and *vicina*, Preston.

*O. lenta* and *venusta*, Smith.

*O. bawriense*, Pilsbry (= *Stenogyra lucida*, Gibbons).

*O. vieirai*, Nobre.

*Ann. & Mag. N. Hist.* Ser. 9. Vol. x.

34

Subgenus RAFFRAYA, Bourguignat, 1883.

*Opeas bocagei*, Nobre.

*Eumea taylori*, Gibbons.

Section STREPTOSTELE, s. s.

*Streptostele signata*, sp. n. (Pl. XIV. fig. 1.)

Shell of fair size, elongate-turritiform, subrimate, thin, silky, transparent, pale olivaceous. Spire produced, sides almost regular, apex rounded. Whorls 9, not very convex, regularly increasing, sculptured with close, regular, slightly curved and oblique transverse striæ, which commence very faintly near the end of the second and are stronger, especially in and for some distance below the sutures, on the later whorls; suture little oblique, subcrenulate, well defined. Aperture ovate, peristome almost imperceptibly thickened; outer lip almost straight in profile for  $\frac{1}{2}$  mm., and then receding considerably to the base; columella rather short, slightly inclined inwards, margin very narrowly triangularly reflexed, forming a minute rima; callus thin, transparent, hardly perceptible; dentition none.

Long. 11·7, lat. 3·6; apert., alt. 3·0, lat. 1·5; last whorl 5·3 mm.

*Hab.* CAMERUN, Bitze (*Bates*).

A rather variable species in both length and diameter of whorl, the type being of intermediate proportions. It is rather closely allied to *S. buchholzi*, Mts., from Buea, but the latter appears to be a larger form.

*Streptostele urguesensis*, sp. n. (Pl. XIV. fig. 2.)

Shell comparatively large, lanceolate, imperforate, transparent, silky, pale olivaceous. Spire much produced, sides almost straight, apex acute. Whorls 11, moderately convex, very gradually increasing, first 2 sparsely microscopically punctate, remainder covered with strong, close, regular, almost straight, nearly vertical striæ, weaker on the third and coarser on the penultimate than on the other whorls; suture well defined, moderately oblique. Aperture subpiriform, peristome thickened and extremely narrowly reflexed; outer lip only very slightly angulate forward; columella short, a little concave, with a very small angular twist at its upper extremity; callus pronounced; dentition none.

Long. 13·5, lat. 3·2; apert., alt. 2·5, lat. 1·3; last whorl 4·3 mm.

*Hab.* KENYA, Urguess (*Percival*).

*Streptostele fallooni*, sp. n. (Pl. XIV. fig. 3.)

Shell of moderate size, subfusiform, rimate, thin, silky, translucent, pale milky olivaceous. Spire produced, sides conic until the 6th whorl, thence almost parallel to the base; apex acute. Whorls 9, rather flat, the first 4 increasing very slowly in length and breadth, the next two much more rapidly, thus imparting to the spire its irregular appearance, the last 3 about equal in size; the first  $2\frac{1}{2}$  microscopically punctately malleate, remainder sculptured with extremely faint, close, regular, nearly straight, slightly oblique, transverse striae, which are chiefly visible in the sutures and become further apart on each succeeding whorl; suture nearly horizontal, crenulate, well defined. Aperture subrhombic, flattened at base; peristome thickened, infinitesimally reflexed; outer lip hardly curved outward, sharply angulate forward in profile and then receding to the base; columella nearly straight and vertical, margin thickened and reflexed, so as to form a clear rima; callus very pronounced, with a small, inset, mid-parietal tubercle or fold, which recedes about .5 mm. within the shell.

Long. 8.1, lat. 2.5; apert., alt. 2.1, lat. 1.2; last whorl 3.5 mm.

*Hab.* KENYA, Near Nairobi (*Rev. W. M. Falloon*), Mau Escarpment (*Doherty*).

A remarkable shell, entirely distinct in its combination of shape and dentition from others of the genus.

*Streptostele kenjana*, sp. n. (Pl. XIV. fig. 4.)

Shell comparatively large, acicular, rimate, thin, smooth, rather glossy, somewhat bleached in the type, but normally nearly transparent and pale olivaceous. Spire produced, sides nearly regular, apex acute. Whorls 9, almost flat, regularly increasing, the first 3 densely, but most faintly, microscopically punctate, remainder sculptured with very close and faint, nearly straight and vertical striae, strongest just below the suture, which is only moderately oblique, simple and shallow. Aperture acuminate-ovate, rounded at base; peristome thickened, very slightly reflexed; outer lip a little curved outward, slightly angulate forward in profile and then receding equally slightly to the base; columella concave, margin thickened and triangularly reflexed, forming a small rima; callus and dentition none.

Long. 10.4, lat. 2.9; apert., alt. 2.0, lat. 1.2; last whorl 4.0 mm.

*Hab.* KENYA, Mt. Kenya, 6000–8000 feet (*Kemp*).

Distinguishable from any of its nearest allies by its flatter whorls and finer, fainter, regular sculpture.

*Streptostele oribates*, sp. n. (Pl. XIV. fig. 8.)

Shell comparatively large, elongate-turritiform, subrimate, thin, silky, nearly transparent, pale olivaceous. Spire produced, sides slightly convex at 7th whorl, apex acute. Whorls  $9\frac{1}{2}$ , flattish, regularly increasing, the first  $2\frac{1}{2}$  very densely microscopically punctate, the next very faintly transversely striate, remainder sculptured with clear, fine, close, regular, slightly curved, vertical striæ; suture crenulate, nearly horizontal. Aperture irregularly subovate, peristome slightly thickened, with trace of expansion at the rounded base; outer lip hardly curved outward, scarcely advancing in profile and then receding slightly to the base; columella slightly concave, margin thickened so as to produce a minute rima; callus and dentition none.

Long. 12.2, lat. 3.5; apert., alt. 2.8, lat. 1.8; last whorl 4.7 mm.

*Hab.* KENYA, between the Igembi Hills and Nyeri (*Kemp*).

Probably adult and, as shown by the measurements, a more obese form than most of the genus.

*Streptostele elongata*, sp. n. (Pl. XIV. fig. 10.)

Shell comparatively large, subrimate, much elongate-fusiform, solidified and semibleached in the type, but normally thin, nearly transparent, pale olivaceous. Spire produced, the first 8 whorls gradually tapering, thence almost parallel to the base; apex acute. Whorls 10, rather flat, very gradually increasing, the first 2 faintly microscopically malleate, remainder sculptured with very fine and close, regular, almost straight, very slightly oblique, transverse striæ, which are very faint on the 3rd, less so on the 4th, and stronger on the later whorls; suture but little oblique, simple. Aperture ovate, peristome slightly thickened, with very slight basal expansion; outer lip curved outward, vertical in profile for nearly 1 mm., then receding noticeably to the base; columella straight and erect, triangularly thickened with slight, almost adnate, reflexion, giving the appearance of a minute rima; callus thick; dentition none.

Long. 13·0, lat. 3·0; apert., alt. 3·0, lat. 1·6; last whorl 5·2 mm.

*Hab.* KENYA, Mt. Kenangop, Aberdare Range (*Kemp*).

The fine striation is slightly more oblique and the shell slightly more slender than that of *S. oribates*, its nearest ally; the whorls also increase slightly more gradually.

*Streptostele validior*, sp. n. (Pl. XIV. fig. 11.)

Shell of fair size, lanceolate, subrimate, comparatively solid, silky, translucent, pale olivaceous. Spire produced, sides almost regular, apex acute. Whorls  $10\frac{1}{2}$ , convex, extremely gradually increasing, first 2 smooth, remainder sculptured with close, regular, straight, vertical rib-striæ, extremely faint on the 3rd, but well marked and equal on the later whorls; suture nearly horizontal, scarcely crenulate, well defined. Aperture subrhombic, broadly rounded at base; peristome thickened, extremely slightly reflexed; outer lip curved outward just below the suture, advancing very slightly in profile and then receding nearly as slightly to the base; columella short, erect, margin triangularly thickened and reflexed, nearly concealing the rimation; callus rather faint; dentition none.

Long. 10·5, lat. 2·7; apert., alt. 1·8, lat. 1·3; last whorl 3·2 mm.

*Hab.* UGANDA, Mt. Elgon (*Woodhouse*).

A very distinct species, remarkable for its convex whorls and short wide aperture.

*Streptostele sinuilabiata*, sp. n. (Pl. XIV. fig. 15.)

Shell of fair size, elongate-turritiform, subrimate, rather thin, silky, nearly transparent, milky olivaceous. Spire produced, sides very slightly convex at the 8th whorl, apex mammillate. Whorls 9, moderately convex, gradually and regularly increasing, the first  $2\frac{1}{2}$  smooth, remainder sculptured with close, rather coarse, regular, straight, vertical rib-striæ, which are slightly closer together on the last whorl; suture nearly horizontal, simple, well defined. Aperture quadrate, broadly rounded at base; peristome thickened, minutely reflexed; outer lip hardly curved outward, with an extremely faint inward curve at the angle at which, after a short advance forward in profile, it recedes rather sharply to the base; columella short, thickened, slightly concave, margin narrowly reflexed, forming a minute rima; callus pronounced; dentition none.

Long. 9·7, lat. 2·8; apert., alt. 2·2, lat. 1·2; last whorl 3·8 mm.

*Hab.* UGANDA, Mt. Elgon (*Woodhouse*).

The distinguishing feature of this species is the sharp forward angulation of the outer lip, in contrast with the almost straight striation; this appears to be constant even in immature specimens, and, together with the more rapid increase in length of whorl, separates *sinuilabiata* from its nearest ally, *S. validior*.

The protoconch, as shaken out of an adult shell, contains  $2\frac{1}{2}$  whorls and is practically smooth until just before the outer lip, where there are 2 or 3 extremely faint transverse striæ.

It will be observed that the 7 foregoing species are all thickly callused and show a slight, but clear, peristomatal reflexion, while in at least one instance there is indication of parietal dentition; they may all be accepted as mature, fully formed examples of the highest development that their particular group is capable of attaining. Of the 10 species which follow, none have a reflexed peristome or any sign of dentition and very few show any trace of callus; whether they are actually mature, or would in course of time have developed any of these features, cannot yet be determined.

*Streptostele elgonensis*, sp. n. (Pl. XIV. fig. 9.)

Shell small, acicular, subrimate, thin, silky, transparent, lacteous. Spire produced, sides nearly regular, apex acute. Whorls 9, slightly convex, gradually increasing, the first smooth, second extremely faintly, closely transversely striate, remainder sculptured with well-defined, rather close, regular, straight, vertical rib-striæ, fainter on the base of the last whorl; suture moderately oblique, subcrenulate, well defined. Aperture subrhomboid, peristome simple, outer lip hardly curved outward, advancing very slightly in profile and then receding a little to the base; columella straight and erect, margin moderately thickened, producing a small rimation; callus faint; dentition none.

Long. 8·6, lat. 2·1; apert., alt. 1·7, lat. 1·0; last whorl 3·0 mm.

*Hab.* UGANDA, Mt. Elgon (*Woodhouse*).

*Streptostele hasta*, sp. n. (Pl. XIV. fig. 16.)

Shell of fair size, lanceolate, rimate, thin, smooth, glossy, transparent, pale olivaceous-vitreous. Spire much produced, sides straight, apex acute. Whorls 10, nearly flat, regularly

and very gradually increasing, the first 4 closely, but very faintly, microscopically punctate, remainder sculptured with close, very faint though rather broad, curved, somewhat oblique, transverse striæ; suture moderately oblique, sub-crenulate, well defined. Aperture subrhombic, peristome simple, thin; outer lip but little curved, hardly arched forward and then receding gradually to the base; columella straight and erect, margin narrowly reflexed, forming a minute rima; callus and dentition none.

Long. 11·7, lat. 2·7; apert., alt. 2·2, lat. 1·2; last whorl 4·0 mm.

*Hab.* KENYA, Urguess (*Percival*).

The long straight-sided spire and faint, yet coarse, sculpture distinguish this species from any of its neighbours; it has flatter whorls than *S. crenulata* (Smith).

*Streptostele clavulus*, sp. n. (Pl. XIV. fig. 17.)

Shell of moderate size, acicular, subrimate, thin, smooth, shining, bleached in the type, but normally transparent and pale olivaceous-vitreous. Spire produced, sides almost straight, apex narrowly rounded. Whorls 9, flattened, regularly and gradually increasing, the last showing a faint trace of basal angulation, the first 2 smoothly, densely, microscopically punctate, remainder sculptured with extremely faint, regular, almost straight and vertical striæ, which, under a lens, are only apparent in the sutures on the 4th and 5th whorls, and gradually become more visible on the later ones; suture slightly oblique, crenulate, shallow. Aperture sub-piriform, rounded at base; peristome thin, simple; outer lip curved a little outwards, receding in profile gradually to the base; columella straight, a little inclined inwards, margin very narrowly reflexed; callus and dentition none.

Long. 8·5, lat. 2·3; apert., alt. 2·0, lat. 0·8; last whorl 3·5 mm.

*Hab.* KENYA, Larogi Hills (*Percival*).

The type is somewhat bleached and immature, but quite distinct by reason of its flattened whorls; it differs clearly in sculpture from *S. hasta*.

*Streptostele crassicrenulata*, sp. n. (Pl. XIV. fig. 18.)

Shell of moderate size, acicular, subrimate, thin, smooth, shining, transparent, pale olivaceous-vitreous. Spire produced, sides very slightly convex at the 7th whorl, apex acute. Whorls 10, rather flat, very gradually increasing,



the first  $2\frac{1}{4}$  practically smooth, remainder bearing extremely faint, almost flat, regular, transverse striæ, almost invisible on the smooth whorls, but strongly accentuated in the sutures, which are nearly horizontal, crenulate, and well defined. Aperture subovate; peristome simple, acute; outer lip not much curved outward, straight in profile, slightly receding to the base; columella vertical, margin slightly reflexed, forming a minute rima; callus and dentition none.

Long. 8.2, lat. 2.1; apert., alt. 1.8, lat. 0.8; last whorl 2.8 mm.

*Hab.* KENYA, Forests north of Mt. Kenya (*Percival*).

Compares very closely with the enlarged figure of *S. zambiensis*, Pilsbry, whose sculpture appears to be similar. The last-named, however, is  $3\frac{1}{2}$  mm. longer with the same number of whorls, so is obviously an altogether larger form. The sculpture—or, rather, want thereof, except in the suture—is very remarkable, and distinguishes *S. crassicrenulata* from neighbouring species which resemble it closely in other respects.

*Streptostele patruelis*, sp. n. (Pl. XIV. fig. 22.)

Shell of moderate size, rimate, torpediniform, thin, smooth, dull in the type, but normally transparent and pale olivaceous. Spire produced, sides nearly parallel from the base to the 8th whorl and then gradually tapering to the acute apex. Whorls 10, rather flat, regularly and very gradually increasing, first 4 sparsely microscopically punctate, remainder sculptured with extremely faint, close, nearly straight, moderately oblique, transverse striæ, hardly visible except in the suture, which is nearly horizontal, crenulate, and shallow. Aperture subovate, peristome simple, outer lip very little curved outward, almost straight in profile, only receding very little toward the base; columella very slightly concave, margin narrowly reflexed, forming a clear rima; callus very faint; dentition none.

Long. 8.6, lat. 2.4; apert., alt. 1.7, lat. 1.1; last whorl 3.0 mm.

*Hab.* KENYA, Larogi Hills (*Percival*).

Clearly distinct in shape from the preceding species, which it somewhat resembles in sculpture.

*Streptostele nyiroensis*, sp. n. (Pl. XIV. fig. 23.)

Shell comparatively large, elongate-turritiform, subimate, thin, silky, semitransparent, pale olivaceous. Spire considerably produced, slightly bent to the right, apex acute.

Whorls 10, not very convex, very gradually increasing, the first  $1\frac{1}{2}$  practically smooth, next 2 showing close spiral scratches, the next bearing very faint, close, slightly curved and oblique transverse striæ, which continue, stronger and a little more distant, on the later whorls; suture moderately oblique, shallow, subcrenulate. Aperture subovate; peristome simple; outer lip only moderately curved outward, descending almost straight and vertically in profile; columella straight, erect, margin almost adnately thickened, forming a minute rima; callus and dentition none.

Long. 11·8, lat. 2·7; apert., alt. 2·5, lat. 1·7; last whorl 4·6 mm.

*Hab.* KENYA, Mt. Nyiro, 8300 feet (*Percival*).

A more slender form than *S. elongata* and distinct from *S. urguessensis* by the sculpture of the early whorls.

*Streptostele osculum*, sp. n. (Pl. XIV. fig. 24.)

Shell of moderate size, elongate, rimate, thin, rather glossy, translucent, olivaceous. Spire produced, sides convex at the 6th whorl, apex acute. Whorls 9, not very convex, first 6 regularly and gradually increasing, remainder almost equal; the first 4 faintly microscopically punctate, the 2nd, 3rd, and 4th showing decreasingly faint traces of transverse striation, especially in the suture; remainder sculptured with fine, faint, close, regular, straight, very slightly oblique, transverse striæ; suture nearly horizontal, shallow, with a subcrenulate margin. Aperture suboval; peristome simple; outer lip hardly curved outward, almost straight in profile, only receding very slightly near the base; columella straight, erect, margin narrowly reflexed, forming a small rima; callus very faint; dentition none.

Long. 9·4, lat. 2·4; apert., alt. 1·8, lat. 1·1; last whorl 3·3 mm.

*Hab.* KENYA, Igembi Hills (*Percival*).

This species differs from *S. urguessensis*, perhaps its nearest ally, in being a more slender form with fainter sculpture.

*Streptostele ordinaria*, sp. n. (Pl. XIV. fig. 25.)

Shell of fair size, lanceolate, subrimate, thin, smooth, shining, transparent, pale olivaceous. Spire much produced, sides very slightly convex at the 8th whorl, whence they are parallel to the base; apex acute. Whorls 10, moderately convex, extremely gradually increasing, first 3 faintly, somewhat sparsely microscopically punctate, remainder sculptured

with very faint, close, regular, straight, almost vertical striæ, which are strongest on the 6th and 7th whorls; suture moderately oblique, crenulate, well defined. Aperture subovate, peristome simple, outer lip curved outward, almost straight and vertical in profile; columella very slightly concave, margin thickened sufficiently to form a minute rimation; callus and dentition none.

Long. 10·7, lat. 2·6; apert., alt. 2·3, lat. 0·9; last whorl 4·0 mm.

*Hab.* KENYA, between the Laikipia Plateau and Eusso Nyiro (*Percival*).

*Streptostele crassiplicata*, sp. n. (Pl. XIV. fig. 30.)

Shell rather small, turritiform, subrimate, thin, rather smooth, glossy, transparent, pale olivaceous. Spire produced, sides nearly regular, apex narrowly rounded. Whorls 8, moderately convex, slowly and regularly increasing, the first 2 practically smooth, remainder sculptured with extremely faint, close, straight, vertical striæ, best seen in and just below the suture, which is nearly horizontal, crenulate, and well defined. Aperture irregular, peristome simple, outer lip curved outwards, straight and perpendicular in profile; columella straight, erect, margin extremely narrowly reflexed, forming a minute rimation; callus and dentition none.

Long. 6·8, lat. 2·2; apert., alt. 1·7, lat. 1·0; last whorl 3·0 mm.

*Hab.* KENYA, Jombene Hills, 4000 ft. (*Percival*).

*Streptostele columna*, sp. n. (Pl. XIV. fig. 29.)

Shell of fair size, torpediniiform, subrimate, bleached in the type, but normally thin, silky, nearly transparent, pale olivaceous. Spire produced, sides tapering extremely gradually from the base to the 5th whorl, and thence more rapidly to the narrowly rounded apex. Whorls 10, flattened, extremely gradually increasing, first 3 practically smooth, remainder sculptured with faint, very fine and close, straight, very slightly oblique, transverse striæ; suture oblique, simple, shallow. Aperture subovate, peristome thin, simple; outer lip moderately curved outward, almost straight in profile, receding a little to the base; columella slightly concave, margin narrowly reflexed, forming a minute rima; callus well marked; dentition none.

Long. 10·8, lat. 2·5; apert., alt. 2·0, lat. 1·2; last whorl 3·8 mm.

*Hab.* KENYA, Rumruti, Laikipia Plateau, 6000 ft. (*Kemp*).

Rather widely diffused in the Laikipia District, and showing considerable variation between extremes of form, the fine, close sculpture, however, remaining unchanged.

Subgenus *RAFFRAYA*, Bourguignat.

*Streptostele (Raffraya) clara*, sp. n. (Pl. XIV. fig. 6.)

Shell small, elongate, imperforate, thin, smooth, glossy, transparent, lacteous-vitreous. Spire produced, sides regular, apex bluntly rounded. Whorls 7, rather flat, gradually and regularly increasing, the first 2 smooth, remainder sculptured with close, regular, nearly straight, vertical striæ, very faint on the 3rd and 4th and only a little stronger on the later whorls, but strongest just below the suture, which is crenulate, margined below, and rather shallow. Aperture shortly ovate, very broadly rounded at base; peristome white and shining, thickened, but scarcely reflexed; outer lip well curved outward, hardly advancing in profile, but receding sharply to the base for a little more than half its length; columella concave, of the same thickness as the rest of the peristome; callus clear, but not thick; dentition none.

Long. 5.7, lat. 1.7; apert., alt. 1.4, lat. 0.8; last whorl 2.6 mm.

*Hab.* CAMERUN, Bitze (*Bates*).

*Streptostele (Raffraya) curvata*, sp. n.  
(Pl. XIV. fig. 5.)

Shell small, elongate, rimate, thin, silky, nearly transparent, lacteous. Spire produced, slightly convex on the left and concave on the right side; apex bluntly rounded. Whorls 7, flattish, slightly gradate, regularly and very gradually increasing, the first 2 smooth, remainder sculptured with strong, close, regular, nearly straight, vertical costæ, which become obsolete on the paries; suture hardly crenulate, impressed. Aperture quadrate-ovate, broadly rounded at base; peristome white, shining, minutely reflexed; outer lip slightly sinuous, curved outwards and backwards, in profile, to the base; columella straight, short, slightly inclined inwards, margin broadly triangularly reflexed over the rima; callus almost imperceptible; dentition, a most minute tubercle in the angle of the paries and outer lip.

Long. 6·0, lat. 1·9; apert., alt. 1·6, lat. 0·8; last whorl 2·7 mm.

*Hab.* UGANDA, Mt. Elgon (*Woodhouse*).

*Streptostele (Raffraya) auriformis*, sp. n.  
(Pl. XIV. fig. 7.)

Shell very small, shortly acicular, rimate, rather thin, smooth, translucent, milky-olivaceous. Spire produced, sides nearly parallel from base to 5th whorl, and then tapering slightly more rapidly to the narrowly rounded apex. Whorls 7, convex, gradually increasing, the first 3 practically smooth, remainder sculptured with very faint, close, straight, vertical striæ; suture subcrenulate, well defined. Aperture quadrate, broadly rounded at base; peristome white, shining, thickened and extremely narrowly reflexed; outer lip moderately outcurved, slightly sinuous at the angle at which, after advancing very gradually a short distance in profile, it recedes rather rapidly to the base; columella slightly oblique, with a vertical groove towards its upper extremity, margin narrowly reflexed, almost concealing the small rima; there is a slight tendency towards a callus, but no dentition.

Long. 4·7, lat. 1·6; apert., alt. 1·2, lat. 0·6; last whorl 2·2 mm.

*Hab.* KENYA, Rumruti, Laikipia Plateau, 7000 ft. (*Kemp*).

*Streptostele (Raffraya) cylindrica*, sp. n.  
(Pl. XIV. fig. 41.)

Shell very small, acicular, rimate, thin, smooth, shining, transparent, very pale olivaceous-vitreous. Spire produced, sides slightly convex at the 4th whorl, apex rounded.

Whorls 6½, almost flat, very gradually increasing, the first 2 smooth, remainder, under a strong lens, practically so, the sculpture only being noticeable in the impressed, strongly crenulate suture. Aperture piriform, peristome white, shining, a little thickened and minutely reflexed; outer lip hardly curved outward, angulate very slightly forward and then receding more rapidly to the base; columella rather concave, margin narrowly reflexed over the rima; callus and dentition none.

Long. 4·1, lat. 1·3; apert., alt. 1·1, lat. 0·7; last whorl 1·7 mm.

*Hab.* UGANDA, Mt. Elgon (*Woodhouse*).

Chiefly distinguishable from other known species by its smooth whorls with crenulate suture.

*Streptostele (Raffraya) constricta*, sp. n.  
(Pl. XIV. fig. 40.)

Shell very small, subaciculate, rimate, thin, somewhat silky, transparent, pale olivaceous. Spire produced, sides slightly convex at the 4th whorl, apex rounded. Whorls  $6\frac{1}{2}$ , rather flat, gradually, rather irregularly increasing, the first  $1\frac{1}{2}$  smooth, remainder sculptured with faint, nearly straight, vertical rib-striae, which are most visible in the impressed, crenulate suture. Aperture subpiriform, broadly rounded at base; peristome white, shining, thickened, and very narrowly reflexed; outer lip a little curved outward, very slightly angulate forward and then receding slightly further to the base; columella concave, margin triangularly thickened and expanded, forming a well-marked rima; callus pronounced; dentition none.

Long. 4.1, lat. 1.2; apert., alt. 1.1, lat. 0.75; last whorl 1.8 mm.

*Hab.* KENYA, Kekumega (*Percival*).

Very similar to *S. cylindrica*, but with considerably stronger sculpture.

*Streptostele (Raffraya) unidentata*, sp. n.  
(Pl. XIV. fig. 42.)

Shell extremely small, rather elongate, subrimate, rather thin, silky, semitransparent, pale olivaceous. Spire produced, sides almost parallel, apex narrowly rounded. Whorls 6, rather convex, hardly increasing after the first; the first  $2\frac{1}{2}$  smooth, remainder sculptured with comparatively strong, regular, straight, vertical striae; suture simple, rather impressed. Aperture piriform; peristome white, shining, thickened, minutely reflexed; outer lip hardly curved outward, very slightly angulate forward and then receding a little less slightly to the base; columella erect, thickened, margin narrowly reflexed, forming a minute rima; callus none; dentition consisting of a small sharp denticle, which is not clearly brought out in the figure, near the middle of the paries and an inward swelling, almost amounting to a tubercle, at the angulation of the outer lip.

Long. 2.8, lat. 0.9; apert., alt. 0.5, lat. 0.3; last whorl 1.2 mm.

*Hab.* N. RHODESIA, north bank of R. Zambesi, Victoria Falls (*Soper*).

A wonderful little species, remarkable alike for its minute size and well-marked dentition.

*Streptostele (Raffraya) taylori* (Gibbons).  
(Pl. XIV. fig. 26.)

As this little-known species has never been satisfactorily illustrated, I publish a figure of the type, which is in the British Museum. The dentition consists of a blunt, sinuous, parietal plait hardly visible in the figure, developing into a sharp point a little within the aperture, and a marked protuberance on the incurvation of the outer lip; the shell is 4.8 mm. long.

Subgenus *GRAPTOSTELE*, Pilsbry, 1919.

Minute shells with faint microscopic spiral sculpture.

*Streptostele (Graptostele) candelula*, sp. n.  
(Pl. XIV. fig. 20.)

Shell very small, shortly acicular, imperforate, thin, smooth, glossy, nearly transparent, lacteous. Spire produced, sides tapering extremely gradually, apex broadly rounded. Whorls 7, nearly flat, 2nd and 3rd about equal, remainder very slowly increasing; all are sparsely, faintly, microscopically punctate, practically devoid of transverse sculpture with the exception of an occasional nearly straight and vertical growth-line, and showing traces throughout, under the microscope, of extremely faint, close, flat, spiral striation of somewhat irregular prominence; suture simple, shallow, narrowly margined below. Aperture squarely piri-form, broadened and rather flattened at the base; peristome simple but by no means thin; outer lip receding infinitesimally just below the suture and then advancing slightly before receding markedly to the base; columella slightly concave, margin adnately thickened, callus and dentition none.

Long. 4.1, lat. 1.2; last whorl 1.9 mm.

*Hab.* CAMERUN, Bitze (*Bates*).

The type appears to be mature and, from its faint spiral sculpture, to belong to Pilsbry's subgenus *Graptostele*. It is easily distinguishable from the young of *Raffraya clara* through lacking any of the transverse striation, which shows clearly just below the suture in that species.

*Streptostele (Graptostele) iota*, sp. n. (Pl. XIV. fig. 19.)

Shell very small, shortly acicular, subrimate, thin, smooth, shining, nearly transparent, lacteous. Spire produced, sides

straight, tapering very gradually to the rounded apex. Whorls 7, not very convex, regularly and slowly increasing, practically smooth except for a few vertical growth-lines and several extremely faint, close, rather irregular, incised spiral striæ, which are almost invisible on the type, but are just noticeable under a microscope on all the whorls of a less mature shell; suture simple, a little impressed. Aperture subovate; peristome thin, simple; columella erect, slightly thickened upwards, margin most narrowly reflexed at the base, forming a minute rimation; callus pronounced; dentition none.

Long. 4·3, lat. 1·3; last whorl 1·8 mm.

*Hab.* KENYA, Mt. Kenya, 7000-9000 ft. (*Kemp*); between the Igembi Hills and Nyeri (*Percival*).

*Streptostele (Graptostele) jod*, sp. n.

Differs from the foregoing mainly in having more convex whorls and deeper suture; the incised spiral sculpture also is closer and stronger after the 2nd whorl and the last 2 whorls show a little faint, close, vertical striation. The shell contains 7 whorls and measures:—long. 4·6, lat. 1·5; last whorl 1·9 mm.

*Hab.* KENYA, Rumuti (*Kemp*).

Genus VARICOSTELE, Pilsbry, 1919.

Comparatively large, nearly smooth shells, differing from *Streptostele*, s. s., in the peristome remaining simple and acute at all stages of growth, without thickening, reflexion, or expansion.

I agree with Pilsbry that *Subulina roccatii*, Pollonera, belongs to this genus.

*Varicostele rutshuruensis*, Pilsbry, 1919.

I attribute to this species a shell collected by Kemp on the shore of L. Mutanda, in the extreme south-west corner of Uganda, less than 20 miles from Rutshuru. It agrees well with the description of *rutshuruensis* and is commensurate with the second example whose measurements are given by Pilsbry; its apex, however, is noticeably broader in proportion than that of Pilsbry's enlarged figure, though I cannot say whether this is due to slight inaccuracy in drawing or to individual variation in the shell.

*Varicostele lessensis*, Pilsbry, 1919.

Here, again, shells collected in Uganda by Kemp at Kigezi and by Dummer at Abiri appear inseparable from another



of Pilsbry's species, although the localities are somewhat distant from that in which *lessensis* was found and from each other. They agree so closely in sculpture and dimensions with Pilsbry's description of *lessensis* that they can hardly be varietally distinct, but their spire has a more graceful appearance than in his enlarged figure, agreeing better in this respect with his fig. 15, *V. subvaricosa*, Mts, than with *lessensis*. The columella is adunately thickened, so that in most cases any rimation is completely obscured; in the shells from Abiri close microscopic spiral sculpture is plainly visible in patches on most of the whorls and more faintly on the base, but this feature is probably due to their fresh condition rather than to specific distinction.

*Varicostele curvicolumella*, sp. n. (Pl. XIV. fig. 31.)

Shell of moderate size, elongate-turritiform, imperforate, thin, silky, transparent, pale olivaceous. Spire produced, sides regular, apex rounded. Whorls 7, convex, gradually increasing, the first 2 microscopically punctate, remainder sculptured with close, faint, regular, almost straight, scarcely oblique striæ; suture simple, nearly horizontal, well defined. Aperture shortish ovate, peristome simple, outer lip rather curved outwards, gradually receding in profile to the base; columella inclined inwards from the base, very slightly thickened as it ascends; callus hardly noticeable; dentition none.

Long. 7·9, lat. 2·7; apert., alt. 2·2, lat. 1·3; last whorl 3·8 mm.

*Hab.* UGANDA, Jinja (*Kemp*).

Differs from both the foregoing species in sculpture, the striæ being fainter and wider apart, and in having shorter, more convex, whorls.

#### EXPLANATION OF PLATE XIV.

- Fig.* 1. *Streptostele signata*, Connolly.
- Fig.* 2. — *urguessensis*, Connolly.
- Fig.* 3. — *fallooni*, Connolly.
- Fig.* 4. — *kenyana*, Connolly.
- Fig.* 5. *Raffraya curvata*, Connolly.
- Fig.* 6. — *clara*, Connolly.
- Fig.* 7. — *auriformis*, Connolly.
- Fig.* 8. *Streptostele oribates*, Connolly.
- Fig.* 9. — *elgonensis*, Connolly.
- Fig.* 10. — *elongata*, Connolly.
- Fig.* 11. — *validior*, Connolly.
- Fig.* 12. *Gulella filix*, Connolly.
- Fig.* 13. *Ptychotrema cedrorum*, Connolly.

- Fig. 14. *Gulella disseminata kekumegaensis*, Connolly.  
 Fig. 15. *Streptostele sinuolabata*, Connolly.  
 Fig. 16. — *husta*, Connolly.  
 Fig. 17. — *clavulus*, Connolly.  
 Fig. 18. — *crassicrenulata*, Connolly.  
 Fig. 19. *Graptostele iota*, Connolly.  
 Fig. 20. — *candelula*, Connolly.  
 Fig. 21. *Gulella pisa*, Connolly.  
 Fig. 22. *Streptostele patruelis*, Connolly.  
 Fig. 23. — *nyiroensis*, Connolly.  
 Fig. 24. — *osculum*, Connolly.  
 Fig. 25. — *ordinaria*, Connolly.  
 Fig. 26. *Raffraya taylori* (Gibbons).  
 Fig. 27. *Gulella gwendolinæ scissidens*, Connolly.  
 Fig. 28. — *candela*, Connolly.  
 Fig. 29. *Streptostele columna*, Connolly.  
 Fig. 30. — *crassiplicata*, Connolly.  
 Fig. 31. *Varicostele curvicolumella*, Connolly.  
 Fig. 32. *Ptychotremia fisheri*, Connolly.  
 Fig. 33. *Gulella impedita*, Connolly.  
 Fig. 34. — *perlata*, Connolly.  
 Fig. 35. — *calva*, Connolly.  
 Fig. 36. — *cancellata*, Connolly.  
 Fig. 37. — *minor*, Connolly.  
 Fig. 38. — *salutationis*, Connolly.  
 Fig. 39. — *dupuisi*, Connolly.  
 Fig. 40. *Raffraya constricta*, Connolly.  
 Fig. 41. — *cylindrica*, Connolly.  
 Fig. 42. — *unidentata*, Connolly.  
 Fig. 43. *Marconia elgonensis* (Preston). Uasin Gishu Plateau.  
 Figs. 44, 46, 48, 52-57. *Marconia elgonensis* (Preston). Darugu R. Valley.  
 Figs. 45, 47. *Marconia elgonensis* (Preston), paratypes. Mt. Elgon.  
 Fig. 49. *Marconia latula* (Mts.). Butumbi.  
 Fig. 50. — (Mts.). Migere.  
 Fig. 51. — *margarita* (Prest.). Kigezi.  
 Fig. 58. — *lutula* (Mts.). L. Mutanda.  
 Figs. 59, 60. — *margarita* (Prest.). Fort Portal.

Figures 32 and 43-60 are the exact size of the shells; all the rest are more or less enlarged.

LII.—*Some new Asilidæ from Western Australia.* By WILLIAM J. DAKIN, D.Sc., F.L.S., F.Z.S., Derby Professor of Zoology, University of Liverpool, and M. G. C. FORDHAM, B.Sc., Assist. Lect. Zoology, University of Liverpool.

[Plate XV.]

DURING the period that one of the authors occupied the Chair of Zoology in the University of Western Australia, an attempt was made to bring together a collection of West-Australian insects, particularly of the Diptera. When the

immense area of the State is taken into consideration, the amount of material collected was indeed small. But the same criticism might be applied to the combined collections of Diptera made in the western half of the continent. Very little is really known of the Dipterous fauna, and this is, perhaps, a little remarkable, seeing that Lepidoptera are not

Fig. 1.



Map showing distribution of species described.

common in Western Australia, whilst the Diptera are always a nuisance and often a danger.

One of the results of our effort was the collection of a number of interesting Asilids. Several of these were presented by friends, especially by Mr. J. J. Clark, of the Entomological Department. The specimens have been examined in England, and amongst them we have found at least one

new genus and five new species. There are other records of interest. In this connection attention may once more be drawn to the lack of thought (or of knowledge) in preserving data relative to the distribution of animal life in Australia. Labels, too frequently, give Western Australia as a locality! Few people in Europe seem to be aware that the State is equal in area to the United Kingdom, Germany, France, Italy, Norway, and Spain together. The climatic differences between the extreme tropical north and the wet winter country round Albany in the south are more than would be expected from the distance separating the two regions.

Some specimens of the Asilidæ from Western Australia must have been collected in the "early days" of the State. A few of these are to be found in the British Museum collections, and odd specimens have been seen by one of the writers in certain other museums. Almost all the British Museum specimens were discussed by Ricardo in her papers on the Asilidæ of Australasia (Ann. & Mag. Nat. Hist. 1912 and onwards). Since the publication of Ricardo's papers, White, of Tasmania, has contributed a paper on the Asilidæ of Australia, in which eight new species from Western Australia are described. Two of White's species (the types of which are probably somewhere in Australia) appear in our collection. A list of the West-Australian Asilids, with their distribution, is appended (p. 520).

It was considered advisable to examine the genital armature of the species in our collection, but no attempt will be made here to discuss the genital armature of the Asilidæ. Much more material is necessary, and we have, indeed, grudged damaging the few specimens in our possession. It will be seen that the genital armature of two of the species is rather striking (text-figs. 4, 5, & 6), and, in fact, quite different from that of the other specimens examined (text-fig. 3). Whilst the two species are extremely unlike in general form and appearance, they belong to closely related genera. One of them is a new species of the genus *Neosaropogon*, created by Ricardo for two species previously known. The other is a species which cannot be fitted into existing genera, although it closely approaches *Neosaropogon*. We had no doubt from the general form, etc., that this was a genus quite distinct from *Neosaropogon*. The discovery of the similarity of the genital armature was therefore surprising. However, in view of the fact that practically nothing is known of the genital armature in the Asilidæ, it is not

## silidæ known from Western Australia.

Name of S	Locality in W. Australia.	Distribution outside W. Australia.	Described by
<i>Asilus pelago</i> .....	♂, Swan River.	N.S. Wales, ♀, and Adelaide.	Walker.
— <i>blasio</i> .....	♂, Perth.	♂ ♀, Dandenong Ranges.	Walker.
<i>Bathypogon triatis</i> .....	♂, Perth.	.....	White.
— <i>pedanus</i> .....	♀, Swan River.	.....	Walker.
<i>Blepharotes coriarius</i> .....	♂ ♀, West Australia.	Melbourne, ♀ ♂; Moreton Bay.	Wiedemann.
— <i>finus</i> .....	♂ ♀, Northam.	Queensland and Victoria.	Ricardo.
<i>Chrysopogon albopunctatus</i> .....	♂, Fremantle and Champion Bay.	N.S. Wales.	Macquart.
— <i>splendidiestinus</i> .....	♂, Champion Bay; ♀, West Australia.	.....	Ricardo.
— <i>queenslandi</i> .....	♀, West Australia.	♂ ♀, Queensland.	Ricardo.
— <i>nigricans</i> .....	♀, Perth.	.....	White.
— <i>rufulus</i> .....	♀, Perth.	.....	White.
<i>Laphria telestes</i> .....	♂ ♀, West Australia.	.....	Walker.
— <i>clavata</i> .....	♀, Perth.	.....	White.
<i>Leptogaster occidentalis</i> .....	♂, Cunderdin.	.....	White.
<i>Machimus forrestii</i> .....	♀, West Australia.	.....	Dakin & Fordham.
<i>Neotamias maculatus</i> .....	♀, Perth.	.....	White.
— <i>cynnis</i> .....	♀, Bremer Bay.	.....	Dakin & Fordham.
<i>Neosaropogon froggattii</i> .....	♂ ♀, Champion Bay.	.....	Dakin & Fordham.
<i>Pararatus macrastylus</i> .....	♂ ♀, Swan River and interior of W. Australia.	♂, Mallee Distr., Victoria, and N.S. Wales.	Loew.
<i>Phellus glaucus</i> .....	♂, Swan River.	.....	Walker.
— <i>piäferus</i> .....	♂, Cape Riche.	.....	Dakin & Fordham.
<i>Quasipogon clarkii</i> .....	♀, Cunderdin.	.....	Dakin & Fordham.
<i>Saropogon rubescens</i> .....	♀, Perth.	.....	White.
<i>Saropogon elongatus</i> .....	♂, Perth; ♂, Swan River.	♂ ♀, N.S. Wales, Tasmania, S. Australia, Queensland.	Macquart.
— <i>nicotides</i> .....	♂, Swan River.	.....	Walker.

possible to do otherwise than create a new genus for the second species—the genus *Questopogon*. It appears as if there is a subsection in the *Dasypogoninæ* comprising a number of closely related genera of which *Neosaropogon* and *Questopogon* are two. It will be a point for future investigation in work on this group\*.

## Asilidæ.

### LEPTOGASTRINÆ.

#### *Phellus piliferus*, sp. n.

(Pl. XV. fig. 2; wing, text-fig. 2, A.)

The genus *Phellus* was founded by Walker for one species, and only one species—*Phellus glaucus*—has been known up to the present. This form is peculiarly West Australian, and more especially coastal. It has been stated by Froggatt to occur inland, and we can verify this statement, having specimens from Cunderdin.

As is well known, it is a very large and fine-looking fly, measuring 45 mm. in length. The new species, which may be named *Phellus piliferus*, is equally large and even more striking. There is one specimen only in our collection—a male from Cape Riche (see map, text-fig. 1) on the extreme south coast, a very different environment from the Swan River district. There is, however, a female in the British Museum Collection, and this has not been described. Fortunately, therefore, the two sexes are known.

*Face*.—Brownish yellow, the greater part being hidden by a thick bushy moustache of many long golden-yellow hairs.

*Head* clothed behind with yellow hairs and also beneath.

*Antennæ*.—Third joint brown-red, the two basal joints black. The third joint quite twice as long as the other two.

*Thorax*.—Black, with delicate sparse black hairs on dorsal surface. Laterally the hairy covering is thicker, and stout brown bristles are present. The bristles are rather like those found in the same position on *P. glaucus*, but are more obvious (perhaps owing to state of preservation). Posteriorly the thorax bears a covering of stout yellowish-white hairs. Ventral surface with pale yellow hairs between leg-bases.

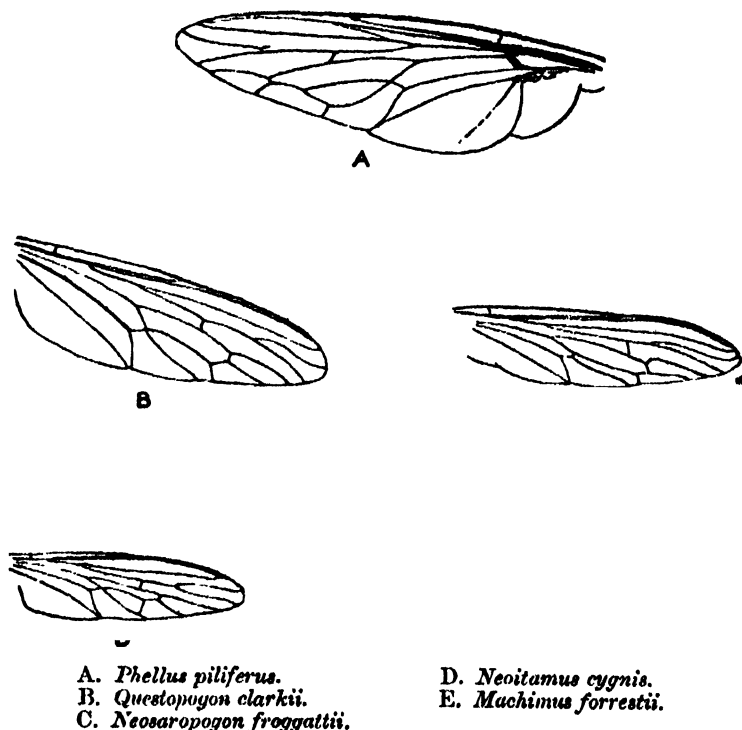
*Legs*.—Superficially there is no great difference from *P. glaucus* in the colour and vestiture of the legs. They are

\* The authors would like to thank Major Austin, of the British Museum, for his assistance, and to state that the types of the new species are now in the B.M. Collection.

black in colour, with the tips of an ochreous or tawny tint. Claws black. Pulvilli light yellow. Stout yellow hairs, similar to those which give the tawny appearance to the tips of the feet in *P. glaucus*, extend amidst the black hairs of the more proximal tarsal segments in *P. piliferus*, especially on the first and second legs.

Yellow bands occur on the hind legs through the presence

Fig. 2.



of yellow hairs amidst the black on the distal fifth of the tibia and the distal half of the first basal segment. Pale yellow hairs are present on the underside of the femur and tibia, more especially on the hind feet.

*Abdomen*.—The most striking feature of the species, which separates it at a glance from *P. glaucus*, is the vestiture of the abdomen. This difference is conspicuous in the two

illustrations (Pl. XV. figs. 1 & 2). In *P. glaucus* (fig. 1) the abdomen is deep metallic blue, with the first two segments thickly covered above with pale yellow hairs. In *P. piliferus* (fig. 2) all the abdominal segments bear, dorsally, a dense covering of bronze-coloured hairs, which are longest over the genital armature.

#### DASYPOGONINÆ.

##### *Neosaropogon froggattii*, sp. n.

The genus *Neosaropogon* was created by Ricardo for species distinguishable from *Saropogon* by their large size, by the absence of any visible style to the third joint of the antennæ, by the fourth posterior cell of the wing being not quite closed or widely open, and by the moustache being composed of numerous bristles about the same size arranged fan-like above the oral opening.

Three species were placed in this genus—viz., *N. princeps*, Macquart, *N. salinator*, Walker, and *N. clavipennis*, Ricardo. The first and the last-named are only recorded from Eastern Australia. *N. salinator* is recorded from the extreme north at Port Darwin in the Northern Territory.

*Neosaropogon froggattii*, sp. n., the type of the new species, is a female from the extreme south coast of Western Australia—Bremer Bay. It is a large species (30–35 mm. in length), with a conspicuous ochreous-yellow abdomen, except for the posterior segments, which are black. The legs are banded black and yellow.

*Face*.—Pale yellow.

*Antennæ*.—Blackish, with more brownish tint on under surface nearer apices. First two joints with blackish bristles, third joint bare and about  $1\frac{1}{2}$  to 2 times length of first two joints together.

*Moustache* of stout white bristles arranged in the characteristic manner of the genus.

Back of *head* with stout black hairs above behind eyes and white hairs below.

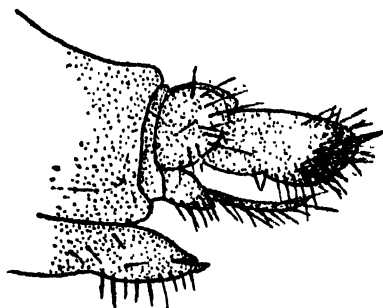
*Thorax*.—Very dark brown, almost black, above with indication of black stripes. Grey tomentum covering sides and extending on coxæ of legs. Dorsum with numerous short black bristles and with long stout black bristles above the root of wing. Scutellum with two stout black bristles, not so long as some of those on posterior part of dorsum of thorax.

*Abdomen*.—Black along lateral margins, but the greater



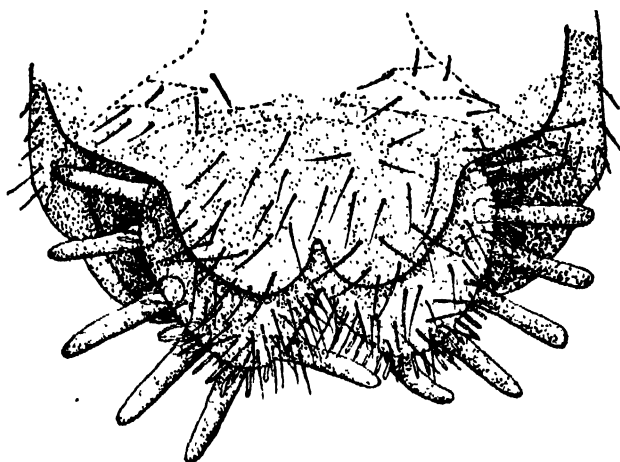
part of dorsal surface yellow-ochre and the ventral surface of a similar tint. The anterior segment is black and the last three completely black. Some grey tomentum is found on

Fig. 3.



*Chrysopogon albopunctatus*. Lateral view.

Fig. 4.



*Neosaropogon froggattii*. Ventral view.

the black lateral areas of the more anterior segments and a few small whitish hairs on the same part. Dorsal surface free from hairs and shiny.

*Legs*.—Distinctly banded in appearance, femur being very dark brown or black, first third of all tibiæ being light yellow and distal two-thirds black. The proximal part of first segment of tarsi is light yellow and the rest black.

Femora, tibiæ, and tarsi all covered regularly with very short black bristles. In addition to this general covering, there are numerous stout bristles on the tibiæ and tarsi and one or two on hind femora.

*Wings* (text-fig. 2, U).—Faintly tinged brown.

*Halteres*.—Yellow-brown.

This is the first record of the genus *Neosaropogon* from the State of Western Australia, and far away from the tropical region of the Northern Territory, whence *N. salinator* is recorded. The most conspicuous difference from *N. salinator* is the colour of the abdomen anteriorly and the colour of the legs.

*Genital armature* (text-fig. 4).—It is unfortunate that no male specimen has been discovered, as the tip of the abdomen of the female is quite interesting in structure and different from the other Asilids we have examined except *Questopogon clarkii*. The structure is sufficiently well illustrated in the figure, which is a ventral view. The stout styles, six in number on each side, are very conspicuous, and they do not occur in other Dasypogoninæ we have examined except *Questopogon*. It is impossible, however, to use this structure at present for purposes of classification, for naturally it has not been possible to examine the posterior end of the abdomen minutely (usually it necessitates removing and mounting the genital appendages) except in a few of our own specimens. We cannot even say that it is characteristic of the genus *Neosaropogon*. Most likely, however, it is characteristic of a subgroup of genera to which both *Neosaropogon* and *Questopogon* belong.

*Questopogon clarkii*, gen. et sp. n. (Pl. XV. fig. 3.)

Two specimens, females, of some size (27 mm.), from Cunderdin, Western Australia, belong to the Dasypogoninæ, but it is apparently impossible to place them in any of the genera already described, although they come near to *Saropogon*. The largest of the species from Australia is given as 15 mm. Ricardo has instituted the genus *Neosaropogon* for certain species distinguished from *Saropogon* by their larger size, but other features—the absence of any visible style to the third joint of the antennæ and the character of the moustache,

well as general form, mark off *Neosaropogon* from the new genus *Questopogon*. It belongs to the group of *Dasypogoninae* in which the fore tibiae bear stout curved spines. The third joint of the antennae bears a short terminal style and is about  $1\frac{1}{2}$  times the length of the two basal segments together. The fourth posterior cell of the wing (text-fig. 2, B) is open. The abdomen is not club-shaped. The body is robust and dark in colour (black, with dark legs, reddish below), with metallic-like tomentum on shoulders of thorax, and with bands of pale yellow hairs on abdomen which give rise to iridescent markings according to the direction of the light falling on the body.

*Face* with yellow tomentum. Tubercle extending up to antennae. Moustache abundant and white or pale yellow in colour, extending up to base of antennae.

*Palpi* black, with black and white pubescence, bearing slightly stronger black hairs at apex.

*Antennae* black, with third joint  $1\frac{1}{2}$ – $1\frac{3}{4}$  times the length of the first two combined. Style short and with abrupt concave apex.

*Thorax*.—Black, with golden tomentum on shoulders and laterally; delicate black hairs on dorsal surface, with very stout white bristles on marked postalar calli and a few similar bristles on posterior margin of scutellum.

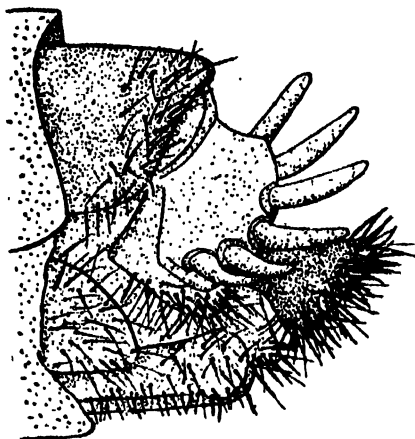
*Abdomen*.—Shining black, depressed, and comparatively broad, gradually diminishing in width to the posterior segment. The abdomen presents a banded appearance in certain lights, due to the arrangement of a close covering of pale yellow iridescent hairs. Each segment possesses laterally a conspicuous area of yellow-bronze tomentum—this is confined laterally and to the posterior half of each segment. The hairs on the dorsal surface of the abdomen are directed outwards (to the right and left sides) on the posterior half of each segment, but on the anterior half of each segment the hairs are directed inward toward the median line. The hairs on the tomentum areas are directed outwards. The hinder segments are not so well clothed with hairs, the two posterior ones possessing only a poor vestiture.

*Legs*.—Coxae black, with white hairs. Femora red below, dark red, almost black, above. Tibiae dark reddish brown, the first and second with black towards the distal end. Tarsi black. All tibiae and tarsi with stout and long white bristles.

*Wings*.—Not altogether clear. Marginal cells just slightly brown. Structure and venation as illustrated (text-fig. 2, B). Fourth posterior cell open.

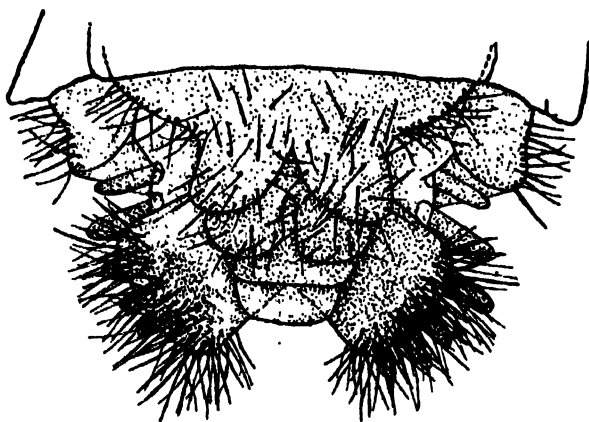
*Genital armature* (text-figs. 5 & 6).—Somewhat to our surprise, seeing that there is little resemblance in the general

Fig. 5.



*Questopogon clarkii*. Lateral view.

Fig. 6.



*Questopogon clarkii*. Ventral view.

appearance of the body, the tip of the abdomen of this form presented the same complicated structure as *Neosaropogon*

*clarkii*. On the other hand, although the two species differ considerably at first sight, it has been shown above that the two genera are closely related. The genital armature is in agreement with this. The same six large styles are present on each side, but the remaining structure is more complicated than that of *Neosaropogon*. There is no point in describing the details here. The illustrations should suffice until we have material for a more complete work on the genital armature of the Asilidæ.

Subgenus *NEOITAMUS*, Ost.-Sack.

*Neoitamus cygnis*, sp. n.

Only one species of *Neoitamus* has been recorded from Western Australia—*Neoitamus maculatus*, White,—and, since White only gives the locality as Western Australia, this means about the same as stating that one specimen of some species had been found in Europe.

There are two specimens of the new species in the collection. Both are females, and were caught in the suburbs of Perth.

Size 22 mm.

*Face*.—Covered with grey tomentum. Moustache composed of yellowish-white bristles, beard white. Antennæ black. Forehead with short black bristles at sides of ocelli. Stout white and black bristles behind upper part of head.

*Thorax*.—Black, with grey tomentum. There is a well-defined black median stripe free from tomentum, broadest anteriorly, and two dorso-lateral dark areas. Stout black bristles on sides of thorax and two on posterior border of scutellum. Scutellum with grey tomentum.

*Abdomen*.—Black, with grey tomentum at sides and at segmentations. Some white pubescence ventrally.

*Ovipositor*.—Black and shiny.

*Legs*.—Femora black. Tarsi black above. Proximal part of tibia yellow-brown above, and the whole joint of this colour below. Fore femora with four stout black bristles below. Middle femora with four slightly weaker bristles. Hind femora with three black bristles near distal extremity, and a few yellowish bristles in the place of the stout black bristles of the anterior femora. All femora with weak grey or white pubescence. Tibiæ and tarsi well armed with black bristles.

*Wings* (text-fig. 2, D).—Clear. Veins dark brown, lighter at base. Small transverse vein at about  $\frac{2}{3}$  of discal cell.

Subgenus *MACHIMUS*, Loew.

Only one species has been recorded up to date from the Australasian region, Ricardo having placed the species *Asilus antilco* of Walker (British Museum Collection) in this subgenus of the old *Asilus*.

A specimen in our collection, unfortunately a female, seems to belong to this subdivision; but, whilst its specific characters seem to be quite satisfactory, the same cannot be said of the generic position. The boundaries of these subgenera of *Asilus* are very unsatisfactory, and will have to be redefined in the future. Unfortunately there are still too few specimens from Australia to take the matter up with the Australian species.

*Machimus forrestii*, sp. n. (Pl. XV. fig. 4.)

Type (female) from Cunderdin, Western Australia. The species is blackish.

*Face*.—Black. The moustache consists of black bristles above and white bristles below.

*Antennæ*.—Black. The third joint with no hairs. A few black hairs are present on the basal joints.

*Thorax*.—Uniformly black, with long black bristles posteriorly. A few whitish hairs are present on the scutellum.

*Legs*.—Black, except tibiæ and tarsi, which are light brown. There are white hairs on the coxæ. The anterior femora are clothed with black hairs and possess a very few black bristles. There are a few black bristles on the middle femora and more on the hind femora. All tibiæ and tarsi bear numerous black bristles as well as a covering of fine hair.

*Wings* (text-fig. 2, E).—Hyaline, with brown pigment on the cross-vein and at the fork of the third longitudinal vein.

*Abdomen*.—Colour dull black. Black bristles are well developed on the posterior margin of the segments, especially on the anterior segments. There are also some delicate white hairs on these segments. Laterally there are inconspicuous and small areas of grey tomentum on each segment.

*Ovipositor* laterally compressed.

Size 17 mm.

SPECIES RECORDED FOR THE FIRST TIME FROM  
WESTERN AUSTRALIA.*ASILINÆ*.*Blapharotes flavus*, Ricardo.

Two specimens in the collection appear to belong to this

species, which was established by Ricardo for specimens from Queensland and Victoria. The range of the species—the specimens in our collection came from Northam—is thus very wide, extending completely across the Australian continent. The specimens, which include male and female examples, do not differ from those described for the Eastern States. The size is markedly different from that of *Blepharotes coriarius*, Wiedemann, being smaller—our specimens of *B. coriarius* are 40 mm., whilst *B. flavus* is ♂ 30 mm. and ♀ 30–34 mm. Ricardo states also that *B. flavus* is smaller than the species *B. coriarius*, but the dimensions given in her paper are just the opposite—*B. coriarius*, ♂ 27 mm.; *B. flavus*, ♂ 30, ♀ 35 mm. This must be a mistake, and, as the difference in size is considerable and of some importance, it is mentioned here.

#### LITERATURE.

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 WHITE. "New Australian Asilidæ." Proc. Roy. Soc. Tasmania. 1913–15.  
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#### EXPLANATION OF PLATE XV.

- Fig. 1. *Phellus glaucus*.  
 Fig. 2. *Phellus piliferus*, sp. n.  
 Fig. 3. *Questopogon clarkii*, gen. et sp. n.  
 Fig. 4. *Machinus forrestii*, sp. n.

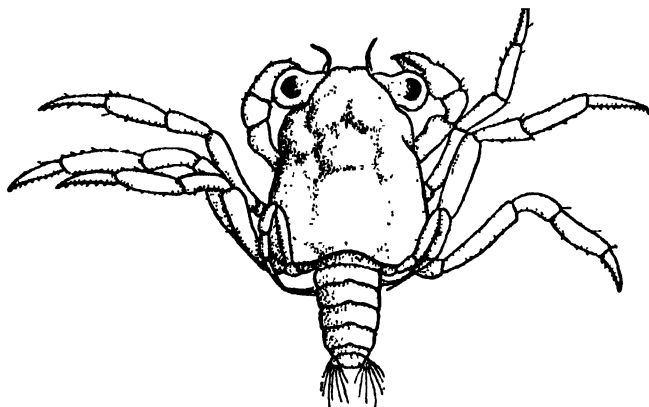
LIII.—*Note on some Young Stages of Gecarcoidea lalandii*, Milne-Edwards. By GLADYS E. WEBB, M.Sc., Assistant in Zoology Department, University College, London.

*Gecarcoidea lalandii*, M.-Edw., is the common Red Crab of Christmas Island. It is mentioned (under the name of *Gecarcinus lagostomus*) by Dr. C. W. Andrews in the 'Monograph of Christmas Island' (1900), where its annual migration to the sea for the purpose of hatching off its eggs is also described.

The following account of the collection of young stages believed to belong to this species is given by Dr. W. T. Calman (Proc. Zool. Soc. 1909, p. 710):—"On his

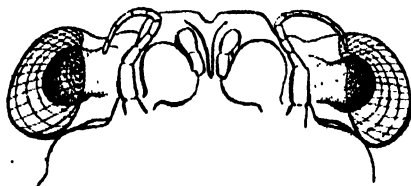
(Dr. Andrews's) visit to the island in 1908, he obtained specimens of a large *Megalopa*-larva, which occurred in enormous quantities in the sea shortly after the migration, and also of a small crab which appeared in similar numbers at a slightly later date. It seems practically certain that these larvæ and young can belong to no other species than *G. lalandii*, and it is hoped that it may be possible to obtain the earlier stages and to give a complete account of the life-history."

Fig. 1.



Megalopa stage. Dorsal view. Length of carapace=3.7 mm.

Fig. 2.

Ventral view of head-region. Megalopa stage.  $\times 38$ .

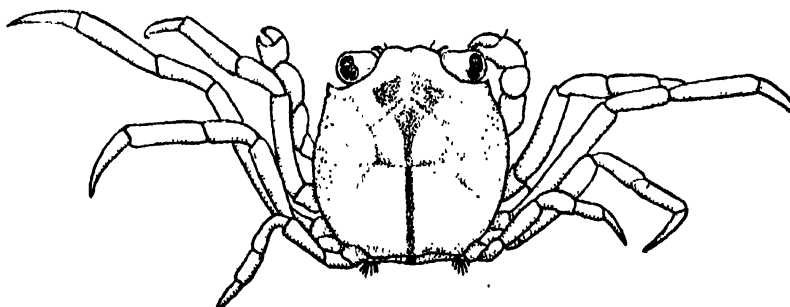
Unfortunately, up to the present no earlier stages have been collected, so this description includes only the megalopa and young post-larval stage mentioned above. It seems probable, however, from the large number and small size of the eggs carried by the berried female, that the young do hatch at an early stage, probably as a zœa or protozœa.



The appendages in both these stages are typically Brachyuran in character, the antennular statocyst being particularly well-developed (fig. 2). The chief feature of interest presented by the Megalopa is the size and position of the last pair of thoracic legs. These are much smaller than the preceding pairs, and the inner margin of the last joint or dactylopodite is not serrate, as in the other claws, but quite smooth, and carries a terminal group of three long setæ (fig. 1). This slender last pair of legs is more dorsal than the others, and is carried bent forwards on the upper surface of the carapace, often with the last three joints closely flexed on the proximal joints.

In the next stage (fig. 3) the fifth pair of legs is not noticeably small in proportion to the other thoracic legs, nor does it terminate in a group of setæ; it is, moreover, carried

Fig. 3.



First young stage. Dorsal view. Length of carapace=4.2 mm.

extended laterally in a normal position, no longer bent up over the back of the animal as in the preceding stage. Evidently, therefore, this peculiar character of the fifth pair of legs is confined solely to the megalopa stage of the life-history; there is no trace of it in the adult crab.

The small size and dorsal position of the fifth thoracic legs in the adult is a character which is typical of certain groups among the Brachyura. These are the Dromiacea; the Dorippidæ and Raninidæ among the Oxystomata; and the Palicidæ and Ptenoplacidæ among the Brachygnatha.

It is not so easy to determine how common this feature is in the megalopa stage of the Brachyura, as the literature on the larval stages is still very incomplete.

It seems, however, that the three main points comprised in

the modification, viz. the small size of the fifth thoracic legs, their dorsal position, and terminal group of three long setæ, may often occur singly as separate characters, the megalopæ of certain species of *Portunus*, for example, having the last thoracic leg tipped with three long curved setæ, but the limb not reduced in size nor markedly dorsal in position.

I have been unable to find any record of a Megalopa in which this modification is so pronounced as in *G. lalandii*.

It is difficult to see of what use this leg can be to a free-swimming larva such as the Megalopa, unless it is used to clean the long-fringed setæ of the pleopods, which tend to become clogged with small fragments as the animal swims through the water. If this is actually the case, it would account for the fact that in the next stage, when the pleopods are no longer used for swimming, the fifth leg is once more normal in structure and position.

Another point of interest is the development of the abdominal appendages or pleopods, in connection with the stage of development at which sex-differentiation becomes externally apparent.

In the adult male of this species the appendages of the first and second abdominal segments only are present, and these are modified as copulatory organs. The adult female has four pairs of biramous pleopods, from the second to the fifth segment inclusive, and in neither sex is there any trace of the uropods. The male may also be distinguished by the possession of larger chelæ and a narrower abdomen than those of the female.

In the megalopa and young stage here described the two sexes cannot as yet be distinguished on external examination. The megalopa has four pairs of biramous pleopods, from the second to the fifth abdominal segment; the outer ramus a flattened oval, thickly bordered with plumose setæ; the inner a blunt process with a group of coupling-hooks at the end of its inner margin. These are linked into similar hooks on the corresponding pleopod of the other side, so that in swimming the two members of a pair move as one. The uropods have no inner ramus, but the outer ramus is well-developed and fringed with plumose setæ.

In the subsequent young stage, the four pairs of pleopods are all reduced to spineless processes, of which only the first two pairs show any trace of a biramous character, while the uropods, though still present, are quite vestigial. This reduction is apparently carried out to the same extent in both sexes, so that in order to attain the condition present in the

adult female, these pleopods must afterwards re-develop, thus providing an example of a phenomenon somewhat uncommon in the animal kingdom, the degeneration of a well-developed and functional organ, and its subsequent re-development at a later stage.

Two specimens of *G. lalandii* which are in the possession of the Natural History Museum, South Kensington, and which were collected by Dr. C. W. Andrews at a spot about 200 feet from the summit of Christmas Island, are respectively a male measuring 18.5 mm. across the carapace and a female measuring 18 mm.

At this stage the abdominal appendages have already assumed the characters of the adults, although the size of the chelæ and abdomen are still the same in both sexes.

Sex-differentiation of the pleopods, therefore, must take place between the first young stage measuring 4.2 mm. across the carapace and the attainment of a size of 18 mm.; and during this period the young crab leaves the sea and migrates inland to take up its future abode in the wooded districts of the interior.

I am indebted to Dr. C. W. Andrews and Dr. W. T. Calman for the loan of specimens and for helpful information and advice.

LIV.—*On a new Brachyurous Crustacean from the Upper Cretaceous of Jamaica.* By THOMAS H. WITHERS, F.G.S.

(Published by permission of the Trustees of the British Museum.)

[Plates XVI. & XVII.]

Dr. D. WOOLACOTT recently presented to the Geological Department of the British Museum some crab-remains collected by him from the Upper Cretaceous of Jamaica, and these were entrusted to me for description.

Cretaceous crabs are always interesting, but the interest is greatly increased when, as in this instance, it is possible by careful development to expose many of the appendages, so that the structure can be studied almost as completely as in a recent specimen. The form here described is not only one of the most complete Cretaceous crabs so far discovered, but is

especially interesting from both a morphological and evolutionary standpoint.

*Carcineretes* \* *woolacotti*, gen. et sp. n.

*Diagnosis*.—Carapace flattened, rectangular, very slightly broader than long; the protogastric lobes are the only ones at all prominent, and are crossed by a transverse ridge—the epigastric line; the frontal region is divided into three lobes, from which it is sharply deflected inwards and downwards to form a shovel-like extension. Orbital region, on either side of the front, wide, thrown into three lobes or teeth, decreasing in width towards the outer orbital angle, which is produced into a prominent tooth, below the base of which the orbit is deeply sunk. Chelipeds rather massive, with the major chela developed on either the right or left. Last pair of ambulatory legs with the propodus and dactylus flattened and broadened to serve as a swimming organ as in the Portunids.

*Occurrence*.—Dr. Woolacott has supplied the following notes regarding the horizon, locality, and associated species:—

Upper Cretaceous (Turonian?). From grey calcareous shale in the bed of the Rio Minho a little to the west of Trout Hall, Chapelton, Jamaica. The shale is several feet thick, and one band of it, about 3 feet in thickness, is crowded with Rudistæ, forming a Rudist-bank. The crab-remains were obtained from this bank.

The crab-remains were associated with Rudistæ, corals, massive Actæonellid gastropods, and *Ostrea*-like bivalves, the fauna being fairly rich and varied. Among the specimens collected by Dr. Woolacott from the Cretaceous limestones of Jamaica, Dr. Trechmann has determined the following:—

*Radiolites cancellatus*, Whitfield †.

*Radiolites* cf. *macroplicatus*, Whitfield.

*Caprina* cf. *jamaicensis*, Whitfield.

He states regarding the Rudistæ collected that “they include several apparently undescribed forms, among them being *Radiolites* both single and growing in clusters. Among the former are forms having the general shape of *R. sauvagesi* of the European Cretaceous.” The species

\* *καρκίνος* = crab; *ῥόνη* = rower.

† “Description of Species of Rudistæ from the Cretaceous Rocks of Jamaica,” Bull. Amer. Mus. Nat. Hist. vol. ix., July 1897, pl. xiii. figs. 3-7.

which occur in the band from which the crab-remains were obtained include:—

*Radiolites cancellatus*, Whitfield.

*Diploria crassolamellosa*, Edwards & Haime.

*Heliastrea cyathiformis*, Duncan.

— *excelsa*, Reuss.

*Acteonella* sp.

The bank is largely composed of *Radiolites cancellatus*, and it is hoped to describe the fauna from this bed more fully later.

*Collection*.—Collected by Dr. D. Woolacott, and presented by him to the Geological Department of the British Museum (registered In. 20780—In. 20782).

*Material*.—Three specimens—holotype, In. 20780, an almost complete male shell with the four ambulatory appendages preserved on the left side; In. 20781, another male carapace with the right minor chela the only one of the appendages preserved; In. 20782, a left major chela.

*Description*.—*Carapace* rectangular; in specimen In. 20781, length 33·4 mm., breadth 35·8 mm.; in In. 20780, length 34·4 mm., breadth 38·8 mm. Anterior margin generally straight and long, the front and the outer orbital spines prominent, although the front is slightly more forward.

The front is divided into three lobes, the median of which is small, longitudinally oval, and separated by deep channels from the other two; from these lobes the front is sharply deflected slightly inwards and downwards to form a somewhat concave shovel-like extension.

On either side of the front the orbital region is marked off into three wide lobes or teeth. The first of these, counting from the front, is the widest; it is concave from the front and becomes convex where it is folded slightly below the next lobe, which is smaller and markedly convex; there is only a slight notch dividing this second lobe from the third small and rounded lobe; this is followed by a deep notch, and then a small tooth which forms part of the much larger outer orbital tooth marking the outer limit of the orbital region.

The lateral margins are almost straight and converge only very slightly towards the posterior margin; they are somewhat rounded at the postero-lateral angle and merge into the posterior margin, which is only slightly concave in the middle. There is a short sharp spine or tooth on each

lateral margin at the distal extremity of the epibranchial lobe, and a bluntly rounded tooth lies immediately below the lateral furrow.

*Surface* generally somewhat flattened, and covered, especially near the lateral and anterior margins, by very fine flattened granules. The most prominent of the several areas are the rather swollen and rounded protogastric lobes, which slope towards the front from a slight but definite ridge—the epigastric line,—which extends transversely across their middle. A similar ridge is seen in the Portunid genera *Scylla* and *Neptunus*. Behind the protogastric lobes is the mesogastric lobe, somewhat globular in shape below, and rather indistinctly produced in front into a narrow bottleneck extension characteristic of this lobe; immediately behind it is the small, rounded, and somewhat crescentic urogastric lobe. Well-defined branchio-cardiac furrows bound the sides of the urogastric lobe and extend below it.

The cervical furrow is well marked, and can be traced between the mesogastric and urogastric lobes; it then extends upwards round the protogastric lobes, and outwards and upwards to the lateral margin near the outer orbital tooth or spine. Immediately below the cervical furrow on the margin is a small triangular lobe—the epibranchial,—followed above by the rather prominent and subtriangular hepatic lobes. Below the cervical furrow on each side are the oblong and rounded mesobranchial lobes, bounded below by the lateral furrow.

Specimen In. 20781, viewed anteriorly, shows the front produced downwards towards the epistome into a bluntly rounded prominence. Below, the epistome is preserved only on the right side, and in its posterior or lower part, which is a narrow spine-like body with a broadly expanded outer extremity; the pointed inner extremity ends just below the front, and appears to have been discontinuous with the left half. Below the front is a short, thick, subtriangular plate (a), which no doubt is the basal joint of the antennule; next to it is a somewhat rounded plate (a'), which is apparently the basal joint of the antenna. The eye-socket is rather wide, deeply excavated, and sunk well below the base of the outer orbital spine. The pterygostomian plate is somewhat displaced, but its inner margin is raised and narrowly bevelled, the basal margin somewhat excavated and with a raised narrow rim, and transversely across the lower part of the plate extends a flatly rounded ridge. All that remains of the third maxilliped is a displaced ischium (i), and this is

a rather broad plate, constricted posteriorly, where it is trilobed, the posterior lobe being the largest; above the second lobe extends a sinuous groove or suture, and from this to the inner anterior angle extends a longitudinal groove similar to that seen in the Eocene *Rhaehiosoma* and *Xanthopsis*.

The abdomen in specimen In. 20781 is partially preserved, only the last two plates being exposed; but in specimen In. 20780 all the plates are present except the last. These two specimens show that the abdomen of the male was only moderately broad, and formed an acute triangle. It was composed evidently of five plates—the first wide and narrow; the second not quite so wide or narrow; the next, evidently representing the third, somewhat broader and not so wide; next an almost square plate, probably representing the fused fourth to sixth plates; lastly, the seventh plate or telson, which is subtriangular, with a somewhat narrowly rounded apex.

The sternal plates are not well exposed. In specimen In. 20781 they are seen to be variously shaped, but the three plates agree in having a narrowly rounded excavation on the anterior margin towards the lateral extremity, which is constricted and produced downwards into a small somewhat triangular body.

Chelipeds stout and their surface generally smooth. The fused basis and ischium is short, rounded, and triangular. Carpus short and somewhat globular, with a broad tooth at the inner angle, a blunt median spine a little removed from the anterior margin, and, towards the outer angle, the surface produced into a boss or prominence. The merus has the posterior margin very thick and rounded, but rapidly thins out anteriorly and towards the articulation with the propodus, and here there is a prominent spine on the posterior margin, followed below by two further equidistant spines, the lowest not being nearly so large as the others.

Chelæ unequal, the major chela developed on either the right or left, as shown by the fact that in In. 20780 the major chela is on the right, while in In. 20781 the minor chela is on the right, and the detached major chela (In. 20782) is a left one. The chelæ are rather massive, rounded from below to the margins, which are upturned to form a ridge and consequent concavity on their inner side; there is a longitudinal ridge extending along the crest of the palm, and on its posterior margin, both at the joint with the dactylus and midway between that and the carpus, the margin

is produced into a short blunt spine; next the articulation of the larger palm with the dactylus there is a large lobe or tooth directed towards the end of the dactylus, as in *Scylla* and *Gatunia*. The digits on their prehensile edges have rather large and closely-set irregular teeth, and the basal tooth in the larger dactylus is much enlarged and directed obliquely backwards as in *Scylla* and *Gatunia*.

The three pairs of ambulatory legs have the segments somewhat flattened; the merus is comparatively long, and the carpus and succeeding segments are very distinctly grooved along their thick anterior margins, the posterior margins being thinner and narrowly rounded. The legs of the last pair are flattened and broadened to serve as swimming organs; the dactylus, which is slightly incompletely preserved, is broadly ovate and leaf-like, and the propodus is expanded and thinned only on the posterior side, in consequence of which the articulation with the dactylus is close to the stouter anterior edge.

*Affinities*.—One of the most conspicuous characters of this crab—a feature hitherto unknown earlier than Tertiary times—is the modification of the last pair of legs into swimming paddles resembling very closely those found in the Cyclo-metopan family Portunidae. This resemblance does not consist merely in the fact that the segments of the limb are broad and flattened: the broadly ovate leaf-like dactylus, the propodus expanded and thinned only on the ventral or posterior side, so that the articulation with the dactylus is close to the stouter dorsal or anterior edge, and the general outline of these and other segments, are closely paralleled in the swimming-paddle of such a form as *Neptunus*. The persistence of this type of limb throughout the large and varied family Portunidae might well lead us to regard it as a character of great phylogenetic significance. It reappears, however, with almost identical form in the genus *Matutu* among the Oxystomata, whose community of inheritance with the Portunidae is very improbable indeed.

The paddle-like extension of the posterior legs is clearly an adaptive character, and may well have been acquired independently by different branches of the Brachyuran stock. This therefore throws no light on the affinities of our present crab.

We consequently have to rely on the structure of the carapace. This is square and flat, and its marked features are the deflexed and trilobed front, the wide stretch marked off into wide rounded teeth on either side of the front, and



the prominent outer orbital teeth. The abdominal segments and the ischium of the third maxilliped show no special features.

Many of the Pre-Cretaceous crabs are allied to the Dromiacea, and it might be thought that this early Cretaceous type would show features in common with that group. Nearly all the Jurassic crabs probably belong to the extinct family Prosoponidæ, and, except in the case of the unique example of *Protocarcinus longipes*, H. Woodward, are known only by their carapace. The carapace is generally longitudinally oval in outline, and has the transverse furrows—the cervical and lateral—prominently marked; the shape of the carapace and the disposition of the furrows show that the Prosoponidæ are allied to the family Homalodromiidæ of the Dromiacea. In our crab the carapace is square rather than longitudinally oblong, although it is not transversely oval as in many modern crabs; but while the transverse furrows are well marked, there is barely a hint of affinity with the Dromiacea. The Dromiacea include the least specialized forms of Brachyura, and retain many primitive characters. One of these is the frequent presence of vestiges of the uropods (the sixth pair of abdominal appendages) in the form of small plates intercalated between the last two segments of the abdomen. These intercalated plates are certainly not developed in our crab, and the legs of the last pair, instead of being reduced or elevated on the back as in many Dromiaceans, are, on the contrary, well developed and modified into swimming-paddles. We cannot, therefore, refer our crab to the Dromiacea, and, in fact, there is nothing at all primitive in any of its characters.

The square flat carapace and, more especially, the strongly deflexed front suggest *Catonetopa*, but the form of the carapace does not resemble in detail any member of that varied group, and the presence of three lobes on the line of deflection of the front is very unlike the arrangement in any *Catonetopan*, where the lobes, often four, are always separated by a median groove. There is, however, one character suggestive of the Portunidæ, and that is the presence of a transverse ridge—the epigastric line—extending across the gastric region, similar to that seen in the genera *Scylla* and *Neptunus*. Moreover, the chelæ are not unlike those in the Portunid genus *Scylla* and in the Miocene genus *Gatunia* of the family Gatuniidæ; in all three forms, next the articulation of the larger palm with the dactylus, there is a large lobe or tooth directed towards the end of the dactylus, and the basal tooth

of the larger dactylus is much enlarged and directed obliquely backwards.

It is in the *Cymopoliidæ*, however, that we find more characters in common, for in *Cymopolia* the carapace is square and flat, especially in certain species such as *C. whitei*, and, although the arrangement of the furrows does not agree in details, a certain general resemblance with them can be traced. The form of the laterally elongated orbits in *Cymopolia*, with their deeply-cut upper margin and the prominent outer orbital teeth, also suggests our crab; and it may be added that some of the legs, although not the last pair, are flattened for swimming. The front, however, is very different, showing no trace of deflection, but having a median emargination and a thin edge.

On the whole, though the indications of affinity are conflicting, it seems probable that *Cymopolia* is the nearest relative of this Cretaceous crab, with possibly some relationship to the *Portunidæ*. Though *Cymopolia* is now usually placed in the *Catometopa*, the fact that its systematic position was till recently the subject of discussion increases the likelihood that it may be the survivor of a primitive group still showing traces of divergent affinity with widely different groups.

In conclusion, I wish to thank Dr. F. A. Bather, F.R.S., and Miss M. J. Rathbun for their assistance, and also Dr. W. T. Calman, F.R.S., who not only gave me access to the collection of recent crabs in his charge, but helped me in other ways.

#### EXPLANATION OF THE PLATES.

*Carcineretes woolacotti*, gen. et sp. n.

##### PLATE XVI.

*Fig. 1.* Dorsal view of almost complete male shell, with the ambulatory appendages on the left side. Holotype, B.M., In. 20780.

##### PLATE XVII.

*Fig. 2.* Abdominal view of same.

*Fig. 3.* Dorsal view of another male shell, with the right minor chela the only one of the appendages preserved. B.M., In. 20781.

*Fig. 4.* Abdominal view of same.

*Fig. 5.* Anterior view of same.

*Fig. 6.* Left major chela of another specimen. B.M., In. 20782.

Fig. 1,  $\times 2$  diam.; Figs. 2-6,  $\times 1\frac{1}{2}$  diam.

LV. — *Macrotherium salinum*, *sp. n.*, a new *Chalicothere* from India. By C. FORSTER-COOPER, M.A., Superintendent of the University Museum of Zoology, Cambridge.

AMONG some fragmentary specimens from the salt-range of India, said to have been found near Chenji, and therefore Sarmatian in age, is a left upper molar of a *Chalicothere*, which is different in certain particulars from other species of the family hitherto described from India.

This tooth is in good condition, only just touched by wear, and, as there is no sign of any pressure-mark on the hind border, is presumably a third molar. It is approximately square in outline, measuring 38 mm. along the outside border and 39 mm. along a line from the cingulum of the protocone to the outside edge of the parastyle.

The forms so far described from India are:—

*Phyllotillon naricus* (Pilgrim \*).

*Schizotherium pilgrimi* (Forster-Cooper †).

*Chalicotherium* (*Circotherium*) *sivalense* (Falconer & Cautley ‡).

The first two species are from the earlier deposits of the Bugti beds, and from the first-mentioned the present specimen can at once be distinguished by its being square instead of oblong in shape, from the second by its much larger size, and from *C. sivalense* by the absence in the latter of a protoconule, a feature to which attention has not hitherto been drawn.

The present specimen, for which the name *Macrotherium* § *salinum* is proposed, has the following characters:—The crown surface (fig. 1) shows a well-marked protocone, from which a sharply defined ridge runs in a wide curve to the protoconule. The latter cusp is rather more sharply defined from the paracone than is usually the case. The cingulum is broad in front and runs round the protocone, and ends in the valley between the protocone and hypocone. It is not interrupted by the protocone as it is in *C. sinense* and, to some extent, in *P. naricus*.

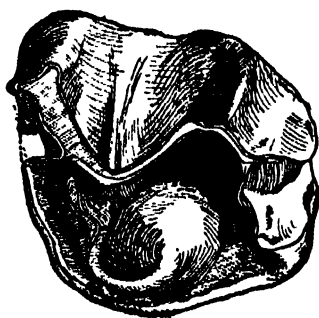
\* Pilgrim, Mem. Geol. Surv. India, n. s., vol. iv. p. 34, and Forster-Cooper, P. Z. S. 1920, p. 357.

† Loc. cit. p. 362.

‡ Trans. Geol. Soc. 1837, and Falconer's Memoirs, vol. i. pl. xvii.

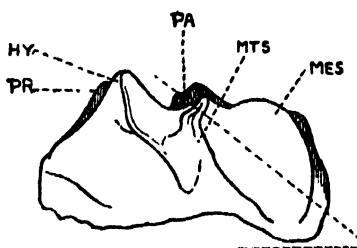
§ The attribution to this particular genus is tentative only, and is based upon the subequal shape of the tooth (comp. Holland and Peterson, Mem. Carnegie Museum, vol. iii. p. 210).

Fig. 1.



Third upper left molar of *Macrotherium salinum*, sp. n.  
Surface view, a shade larger than natural size.

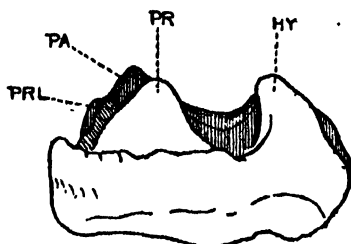
Fig. 2.



View of hinder border of the tooth, natural size. The dotted lines show the angle of slope of the paracone.

PR=protocone; PA=paracone; PRL=protoconule; HY=hypocone;  
MTS=metastyle; MES=mesostyle.

Fig. 3.



View of lingual side of the tooth, natural size.

The hypocone (figs. 2 & 3) is compressed, bent rather forwards, and is higher than the protocone. The external wall of the paracone (fig. 2) is much bent inwards.

This tooth, therefore, does not resemble any Indian forms hitherto described. In size and general shape it is at first sight somewhat like *Chalicotherium* (*Circotherium*) *sivalense*. The latter species, however, the type-specimens of which are in the British Museum, shows in one point a very distinct difference not only from the present species, but apparently from all Chalicotheres with the exception of *C. sinense*.

Osborn\*, in his description of *Eomoropus*, states that a protoconule is characteristic of all known Chalicotheres. *C. sivalense*, however, certainly lacks the cusp, which is not shown in Falconer's figure on either the second or third molars. An inspection of the actual specimens shows that his drawings are correct, and, as the third molar is quite unworn and in good preservation, there can be no doubt that this cusp is really absent. The figure of *Chalicotherium sinense* (Owen) in the 'Catalogue of Fossil Mammalia of the British Museum' (part iii. page 165) shows very clearly that the protoconule was absent also in this tooth. The absence of a protoconule may therefore be added as another character to the definition of the genus *Circotherium* as given by Holland and Peterson†.

#### LVI.—*Descriptions and Records of Bees*.—XCVI.

By T. D. A. COCKERELL, University of Colorado.

##### *Augochlora humeralis*, Patton.

Patton described this species from specimens collected by Williston in North-western Kansas. Robertson suggested that it might be *fervida*, Smith, to which Patton considered it allied. As *fervida* is wide-spread in Kansas and Texas, and I had nothing agreeing better with *humeralis*, I supposed that the suggested synonymy might be correct. However, on July 23, 1922, Mr. Earl G. Smith took a female at flowers of *Peritoma serrulatum*, about five miles south-east of Cornish, Colorado, which agrees excellently with Patton's

\* Bull. Am. Mus. Nat. Hist. vol. xxxii. p. 268.

† *Loc. cit.* p. 211.

description, and is obviously distinct from *fervida*. *A. humeralis* is thus established as valid, and will be recognized especially by the dark antennæ; anterior angles of prothorax extremely prominent and sharp; area of metathorax very large, longer than postscutellum, finely rugulose all over, but not otherwise sculptured; posterior truncation shining, with very strong sharp margins. Abdomen dullish, with fine punctures of different sizes; hind spur with only three spines, these very long. Vachal has proposed to change the name to *pattoni*, on account of Sichel's earlier *humeralis*, but I do not think Sichel's bee is congeneric.

*Alcidamea grinnelli*, Cockerell.

Described from the ♀ in 1910. I have now before me two males from the mountains near Claremont, California (Baker, 7222, 7235). They are about 6 mm. long, resembling *A. simplex* (Cress.), but easily separated by the strongly dusky wings, more closely punctured mesothorax, and castaneous tegulæ. The process on second ventral segment is of the same kind, though rather smaller. The hind margins of the abdominal segments are ferruginous; the apical process is distinctly broader, and reddish. The flagellum is bright ferruginous beneath.

The Californian *A. colei*, Crawford, is considerably smaller, with clearer wings.

*Ashmeadiella floridana* (Robertson).

I have not seen *Ileriades floridanus*, Rob., 1897, but Professor Titus informed me many years ago that Robertson referred it to *Ashmeadiella*.

*Ashmeadiella meliloti* (Cockerell).

♂.—Albuquerque, New Mexico, June 2, 1911 (Watson).

*Ashmeadiella wislizeni*, sp. n.

♂.—Length about 5.5 mm.

Black, similar to *A. meliloti*, but differing thus: the four teeth at apex of abdomen nearly equal in size, the middle pair hardly longer than broad; mesothorax shining, with large sparse punctures; first r. n. joining second s. n. at a distance from its base conspicuously less than length of

intercubitus. By the short middle teeth of abdomen it resembles *A. schwarzi*, Titus, but in that species the teeth are red and the thorax is apparently more densely punctured.

Mesilla Park, New Mexico, 3800 ft. alt., at flowers of *Dithyrea wislizeni*, Engelm., May 7 (Cockerell).

I have long had this in my collection, mixed with *A. meliloti*, but it is certainly distinct. At the same time, place, and flowers, I also took *Perdita exclamans*, Ckll.

*Ashmeadiella californica* (Ashmead).

Described by Ashmead (1897) as a *Chalicodoma*. A male before me is from Claremont, California (Baker, 7223). The wings are greyish, not "subfuscous"; hair on head and thorax above ochreous; median apical teeth of abdomen long.

*Heriades carinatus*, Cresson.

♀.—Fedor, Texas (Birkman).

*Robertsonella dolichosoma*, sp. n.

♀.—Length about 7 mm.

Black, elongate, finely punctured; pubescence thin and white, thorax above nearly bare; abdomen with conspicuous narrow white hair-bands; ventral scopa white; maxillary palpi 4-jointed, last joint very small; clypeus convex, minutely and very densely punctured, not hairy. Antennæ black, flagellum stout; a smooth shining space above each antenna; facial quadrangle longer than broad, but head rather broad; front very densely and minutely punctured; thorax rather long; mesothorax and scutellum shining, finely and quite closely punctured; area of metathorax dull, except its descending apex, which is polished; tegulæ shining black. Wings dilute fuliginous; b.n. falling a little short of nervulus; first r.n. ending a short distance from base of second s.m., hardly half the distance of second r.n. from apex. Legs entirely black, spurs pale reddish. Abdomen shining, closely and very finely punctured, the punctures practically uniform throughout.

Mountains near Claremont, California (Baker, 7225). Easily known from the two previously described species by the longer thorax and quite different sculpture of abdomen. It is not *Heriades albicinctum*, Prov., which Titus has

ascertained to be a synonym of *Chelostoma californicum*, Cresson.

*Sphecodes pecosensis salicis*, subsp. n.

♀.—Length about 9 mm.

Similar to *S. pecosensis*, Ckll., with inner tooth on mandibles and deep dorsal constriction between first and second abdominal segments, but differing thus: area of metathorax not defined, covered with very coarse vermiform (not straight) rugæ. Abdomen dusky chestnut-red, brighter on first two segments.

Mountains near Claremont, California, on *Salix* (Baker; Pomona College, 221).

*Perdita sphæralceæ ridens*, var. n.

♂.—Head extremely large, quadrate, broader than thorax, with the cheeks broadened and strongly projecting, obtusely angled; abdomen dull red with narrow yellow bands. Runs exactly to *P. sphæralceæ* in my tables, and while it looks very distinct, it is only a large-headed variety, such as occurs occasionally in other Panurgids.

Mesilla, New Mexico, at flowers of *Sphæralcea lobata*, var. *perpallida*, Ckll., Sept. 10 (Cockerell).

*Perdita platyura*, sp. n.

♀.—Length about 4.5 mm.

Robust, with very broad flat abdomen; head and thorax with thin but rather abundant white hair; head dark blue, shining, of ordinary form, facial quadrangle square; mandibles sordid whitish, red at apex; labrum sordid whitish, shining, prominent; cheeks dark; clypeus and lateral face-marks dull white, clypeus with the margins above broadly black, so that the white area is conical; lateral marks triangular, reaching about to level of antennæ, excavated on inner side above; thorax dark blue-green, mesothorax dullish, tubercles dark. Wings milky hyaline with colourless nervures, stigma pale yellow; marginal cell squarely truncate; second s.m. long, receiving both recurrent nervures. Legs dark brown, very hairy, tarsi whitish, anterior tibiæ pale yellow in front. Abdomen above rather light brown, with large dusky sublateral spots, apex pale reddish, venter reddish brown.



Las Truchas, Guadalupe County, New Mexico (*Clara Gerhardt*).

In my tables of *Perdita* this finds no place, because the abdomen is spotted, but the markings are dark instead of light. It runs nearest to *P. asteris*, Ckll., and *P. fedorensis*, Ckll. It closely resembles *asteris* in the face-markings, but is easily separated by the abdomen.

*Euryglossella nothula*, sp. n.

♀.—Length about 4 mm.

Head and thorax black, abdomen purplish. In all respects very like *E. globuliceps*, Ckll., with the same incomplete second s.m., but separated thus: inner orbital margins with a yellow line; lower margin of clypeus, labrum, mandibles, and lower part of cheeks ferruginous; scape in front and under side of the very stout flagellum more or less ferruginous; head larger and more quadrate, the vertex elevated; anterior tibiæ and all the tarsi pale, with a slightly reddish tint, hind tibiæ reddened apically.

Bribie Island, Queensland, 9 ♀, August 29, 1918 (*H. Hacker*).

*Euryglossella atomaria*, Cockerell.

Brisbane, Sept. 26, 1916 (*Hacker*). A striking feature of this species is the pale yellow ventral surface of abdomen. On the same day Mr. Hacker took what must be considered the hitherto unknown male. It differs by the sepia-brown stigma and the obscure face-markings, the clypeus, lower part of supraclypeal area, and lower corners of face suffusedly and obscurely yellowish. The mandibles are clear pale yellow, dark at apex.

*Andrena spectabilis*, Smith.

I found this in the Oxford Museum. General aspect of *A. morio*, Brullé, but not so large, with white hair at sides of face, and area of metathorax with strong wrinkled rugæ.

*Andrena concinna*, Smith.

Oxford Museum. Stigma small and slender; hair at end of abdomen clear light ferruginous. In the S. S. Saunders collection is a male supposed to be *concinna*, but, as E. Saunders remarks in an appended note, the association cannot be proved correct.

*Andrena subglobosa*, Dours.

In the S. S. Saunders collection is a note by E. Saunders, querying whether this may be identical with *pallidicincta*, Brullé.

*Andrena breviscopa*, Pérez.

♀ in Mr. Morice's collection. Third s.m. very long; second s.m. receiving r.n. in middle; area of metathorax granular, the whole metathorax covered with long hair; hair of thorax above fulvous, bright on scutellum; stigma ferruginous with dark margin. General aspect of *afzeliella* and *wilkella*.

*Epicharis albofasciata*, Smith.

This has been regarded as the same as *E. maculata*, Smith. I examined the types in British Museum. *E. albofasciata* has the bands yellow, not white. *E. maculata* type (♀) has two yellow spots on scutellum; *albofasciata* (♂) has a broad band. There is another specimen of *albofasciata* from Pará, and many are from San Feliz, Panama (*Champion*).

*Epicharis cockerelli*, Friese.

The British Museum has a pair from Ducke. In the ♀ there are four large yellow spots on each side of the black abdomen; in the ♂ entire bands, the first deeply notched in front.

*Epicharis duckei*, Friese.

The ♀ has a large yellow patch on each side of second abdominal segment; the ♂ has an entire band, with anterior margin concave. *E. duckei* has a yellow band on scutellum, wanting in *cockerelli*.

*Halictus inornatus*, Bingham.

S. Africa. Oxford Museum. About 9.5 mm. long; black; area of metathorax short, dull, and rugose; pale tomentum at bases of abdominal segments; hind spur pectinate, with stout spines.

*Halictus cariniventris flavotectus*, subsp. n.

♀.—Head and thorax somewhat more robust; mandibles red in middle; abdomen above more densely pubescent, with bright yellowish hair hiding the surface. Wings slightly greyish.

Quetta, India, July 1903 (*Nurse*).

The specimen of *H. cariniventris*, Morawitz, used for comparison was collected at Buda by Friese, May 29, 1886, and was referred by him to that species with some doubt. Morawitz described the species from the male, collected in Turkestan; in 1895 Dalla Torre and Friese recorded it from the Caucasus. I have not been able to see any Asiatic material of true *cariniventris*, and it is possible that when females are obtained in Turkestan, they will prove identical with the Quetta form.

Compared with *H. vestitus*, Lep., *flavotectus* is easily distinguished by being much larger and more robust, with yellow instead of white tomentum on abdomen. The mesothorax and scutellum are yellow-green, while in *vestitus* they are dark blue-green.

*Megachile marginata*, Smith.

I saw the type (♀) at Oxford. There is a strong band of tomentum in scutello-mesothoracic suture; abdominal bands very light and distinct; eyes light red; ventral scopa black on last segment and fuscous on apex of penultimate one.

LVII.—*A new Species of Mastacomys from a Cave in South Australia.* By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

AMONG some rodent-remains found in guano-caves in S. Australia, presented to the Museum by Prof. Wood-Jones, and illustrative of his paper on the molar roots of Muridæ, there occurs the upper jaw of a *Mastacomys*—a genus as yet only known from one Tasmanian example, the type of *M. fuscus*,

one immature specimen from Victoria, and some cave-remains from New South Wales\*.

The Victorian and New South Wales specimens are both of just about the same size as the original Tasmanian example.

But the South-Australian one is considerably smaller, and obviously of a different species. It may be called

*Mastacomys mordicus*, sp. n.

Size, as gauged by teeth, only about three-fourths of that of *M. fuscus*. Teeth quite similar in structure to those of that animal.

Skull apparently lower in proportion, at least anteriorly, the zygomatic plate measuring in height only about 5·7 mm. from the upper bridge to the lower edge of the foramen, while in the type of *fuscus* this measurement is 6·9 mm. Anterior edge of plate deeply and abruptly cut out to a depth equal to half its height, that of *fuscus* only evenly but slightly concave.

The molar roots are as follows:— $M^1$ , a large antero-external, a small postero-external, and two smaller inner, near together, therefore four in all;  $m^2$ , four subequal roots, placed in a square;  $m^3$ , three roots, two large anterior level with each other, and a large median posterior. This arrangement is not at all like that of any of the forms illustrated in Prof. Wood-Jones's recent paper on the subject.

Length of the molar tooth-row, alveolar 9·1 mm., grinding-surface (unworn) 7·2 (respectively 10·1 and 8·5 mm. in *M. fuscus*); greatest breadth of  $m^1$  3·0.

*Hab.* Mt. Gambier district, S. Australia. Type from a guano-cave.

*Type.* A right maxilla, with the three molars. B.M. no. 22. 10. 1. 3. Presented by Prof. F. Wood-Jones.

While the Eastern forms from New South Wales and Tasmania are all of about the same size, this South-Australian species is readily distinguishable by its much smaller dimensions.

Whether it is still to be numbered among the recent fauna of South Australia remains to be proved.

\* The specimens from Central Australia referred by Mr. Waite (Zool. Horn Exp. p. 406, fig. 6, 1896) to *Mastacomys* would seem to be either *Rattus* or *Pseudomys*. The molars are not broad enough in proportion to their length for those of *Mastacomys*.

I.VIII.—*A new Jird (Meriones) from Southern Palestine.*  
By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

MR. P. A. BUXTON, the donor of so many interesting mammals from Palestine and Mesopotamia to the National Museum, has now sent three examples of a *Meriones* of the "b" group, allied to *M. lybicus* and *syrius*, but evidently distinct from both. It may be called

*Meriones sacramenti* \*, sp. n.

General colour above as in *M. syrius*, though the light eye- and ear-patches are a little more evident. Under surface wholly white to the bases of the hairs, while in both *syrius* and *lybicus* the hairs are slaty at their bases. Tail buffy like the body for its basal part, not ochraceous, its end tufted and blackened as in the allied species, the extreme tip white in the type (imperfect in the other two specimens).

Skull of the same size as in *lybicus* and *syrius*, and with similarly developed bullæ and supra-mental triangles, all three being members of group *b* of my paper on the genus †. But the interorbital width is markedly narrower than in either, a character evidently diagnostic of the species.

Dimensions (measured in the flesh) :—

Head and body 160 mm.; tail 150; hind foot 36; ear 18·5.

Skull: median length 40; greatest diagonal length 41·6; condylo-incisive length 32; nasals 15·2; interorbital breadth 6·1; mental breadth 23·8; palatine foramina 7·8; upper molar series 5·9.

*Hab.* Southern Palestine. Type from 10 miles south of Beer-sheba.

*Type.* Adult male. B.M. no. 22. 10. 4. 1. Original number 529. Collected 17th July, 1922, and presented by P. A. Buxton, Esq. Three specimens examined.

This South-Palestine Jird is only nearly related to the above two species of the *b* group, and from these may be

\* Beer-sheba = the well of the oath or covenant (*sacramentum*).

† Ann. & Mag. Nat. Hist. (9) iii. p. 203 (1919).

readily distinguished by its narrow interorbital space and wholly white under surface.

For members of the genus *Meriones* the name Jird, first introduced by Shaw in 1738, and spasmodically used by various authors ever since, may well be adopted as a standard vernacular term, the word Gerbil being restricted to *Gerbillus* and its nearer allies.

### BIBLIOGRAPHICAL NOTICE.

*The Coccidæ of Ceylon.*—Part V. By E. E. GREEN.  
Dulau & Co. 1922.

THE last part of Green's monumental work on the Coccidæ of Ceylon has appeared. Like the preceding parts, the work is profusely illustrated, the plates being done from drawings by the author himself; each species is very carefully delineated, and many of the figures coloured. Though the price is high (£3), considering the class of work and the cost of production it is not excessive. By the conclusion of the work the author has contributed in no small way in placing the study of the Coccidæ upon a footing, from a systematic point of view, such as few families of insects have reached. The work is not only a description of the adult insect itself; in nearly all cases the early stages are described, and very valuable field-notes, made by the author while in Ceylon, are included. In the present part the Eriococcinæ, Dactylopiinæ, Tachardiinæ, Ortheziinæ, Margarodinæ, and Monophlebinæ are dealt with. Six new genera, twenty-seven new species, and several new varieties are described. The author's conception of the limits of the genus *Monophlebus*—and he is probably right—is wider than that of some other authors, the genera *Drosicha*, *Llaveia*, *Tessarabobus*, *Ortonia*, *Guerinia*, and *Monophlebulus* being sunk as synonyms. Two appendices are added, the first correcting, emending, or adding to the previous parts, and the second giving a very useful list of those species of Coccidæ which have been described as new or recorded from Ceylon since the various parts were first published.

L.

### PROCEEDINGS OF LEARNED SOCIETIES.

#### GEOLOGICAL SOCIETY.

May 24th, 1922.—Prof. A. C. Seward, Sc.D., F.R.S., President, and afterwards Dr. G. T. Prior, F.R.S., Vice-President, in the Chair.

The PRESIDENT then proceeded to deliver a lecture (illustrated

by lantern-slides, microscope-slides, specimens of rocks, fossils, and plants) entitled 'Geological Notes on Western Greenland.' He remarked that Greenland is a 'closed' country; the trade is a monopoly of the Danish Government, and no foreigners or Danes other than Government officials are allowed to go there without special permission. On June 18th, 1921, the Lecturer left Copenhagen, accompanied by Mr. R. E. Holttum, of St. John's College, with the primary object of collecting fossil and recent plants on Disco Island and at other localities between lat.  $69^{\circ}$  N. and  $71^{\circ}$  N. Godthaab was reached on June 28th, and Godhavn (Disco Island) on July 4th. Rather more than three weeks were passed at the Arctic Station at Godhavn with Mr. Porsild, the Director, who rendered invaluable service. The Arctic Station, which was planned and directed by Mr. Porsild, was afterwards taken over and subsidized by the Danish Government. In the course of two motor-boat excursions, a distance of over 600 miles was covered; many localities were visited on the northern and north-eastern coasts of Disco Island, on the coast of Nugsuak Peninsula, also Hare Island, Upernivik Island, Ritenbenk, Sarkak, and Jakobshavn.

Greenland is an island nearly 1700 miles long, with an average breadth of about 600 miles; approximately a hundred glaciers from the inland ice reach the sea, the largest of which (the Humboldt Glacier) ends in a cliff 60 miles broad. In the course of the lecture attention was called to the various forms of icebergs seen in Greenland waters, and to the views expressed by Mercanton on the origin of the various types. A brief account was given of some of the characteristic types of vegetation. A general account of the physical and geological features of Greenland as a whole was followed by a more detailed description of the Cretaceous and Tertiary sedimentary series of Disco Island and the Nugsuak Peninsula, and of the overlying and protecting basalts which in some places rest directly upon the old Archæan land-surface, to the exclusion of the sedimentary series. Special attention was directed to the nature of the sedimentary rocks (most of which are freshwater in origin), to the occurrence of raised beaches, to evidence of recent sinking of parts of the western coast, and to some of the more striking examples of dykes and sills in the Cretaceous and Tertiary sedimentary series.

No attempt was made to describe the palæobotanical results; but allusion was made to some of the problems presented by the Cretaceous and Tertiary floras.

A hearty vote of thanks was unanimously accorded to the Lecturer.

## MISCELLANEOUS.

*On the Dates of Cuvier, 'Le Règne Animal,' etc. (Disciples Edition).*  
By C. DAVIES SHERBORN.

(Published by permission of the Trustees of the British Museum.)

SEVERAL enquiries have recently reached me for the dates of this book. So far as I know, they are unknown, but in a valuable copy now in the Geological Library of the British Museum (Nat. Hist.) the dates of receipt of the various parts at the British Museum have been carefully recorded. As these give approximately the dates of publication, I append a list:—

**Mammifères :**

Pp. 1- 8.	6. x. 1840.	Pp. 97-101.	9. ii. 1843.
- 16.	3. vii. 1841.	-120.	11. v. 1843.
- 24.	5. i. 1842.	-136.	10. vii. 1843.
- 32.	1. iv. 1842.	-144.	7. xii. 1843.
- 48.	9. ii. 1843.	-160.	7. iii. 1844.
- 56.	7. iii. 1844.	-168.	5. vi. 1844.
- 94.	17. i. 1845.	-176.	26. vii. 1844.
1- 56.	6. vi. 1838.	-184.	11. xii. 1845 [? 44].
- 64.	8. xi. 1838.	-208.	17. i. 1845.
- 72.	4. vi. 1839.	-248.	12. vi. 1845.
- 80.	6. x. 1840.	-328.	11. xii. 1845.
- 88.	5. i. 1842.	-350.	12. xi. 1846.
- 96.	1. x. 1842.		

**Oiseaux :**

Pp. 1- 50.	6. vi. 1838.	Pp. 123-138.	9. xi. 1841.
- 66.	11. x. 1838.	-146.	5. i. 1842.
- 74.	16. iv. 1839.	-162.	1. iv. 1842.
- 82.	10. viii. 1839.	-170.	28. vi. 1842.
- 90.	7. iii. 1844*	-218.	1. x. 1842.
- 98.	9. i. 1840.	-258.	8. xii. 1842.
-106.	2. vii. 1840.	-298.	9. ii. 1843.
-114.	10. ii. 1841.	-370.	11. v. 1843.
-122.	5. i. 1842*.		

**Reptiles :**

Pp. 1- 32.	6. vi. 1838.	Pp. 65- 72.	6. x. 1840.
- 48.	9. i. 1840.	- 80.	10. ii. 1841.
- 64.	2. vii. 1840.	-169.	28. vi. 1842.

**Pisces :**

Pp. 1- 24.	6. vi. 1838.	Pp. 121-136.	10. ii. 1841.
- 40.	11. x. 1838.	-152.	3. vii. 1841.
- 48.	4. vi. 1839.	-176.	9. xi. 1841.
- 64.	9. i. 1840.	-184.	5. i. 1842.
- 72.	6. x. 1840.	-192.	9. ii. 1843.
- 80.	9. i. 1840.	-200.	1. iv. 1842.
- 96.	2. vii. 1840.	-360.	1. x. 1842.
-120.	6. x. 1840.	-392.	11. v. 1843.

Obviously imperfections supplied later.



**Mollusques :**

Pp. i-xii,	9. xi. 1841.
-xx.	8. xii. 1842.
-xxviii.	7. xii. 1843.
-xxxvi.	7. iii. 1844.
1- 8.	6. vi. 1838.
- 16.	11. xii. 1845 *.
- 80.	6. vi. 1838.
-112.	11. x. 1833.
-128.	16. iv. 1839.
-136.	4. vi. 1839.
-144.	10. viii. 1839.

Pp. 145-152.	9. i. 1840.
-160.	6. x. 1840.
-168.	2. vii. 1840.
-176.	6. x. 1840.
-184.	9. ii. 1843 *.
-200.	3. vii. 1841.
-208.	11. v. 1843.
-224.	10. viii. 1843.
-240.	7. xii. 1843.
-266.	5. vi. 1844.

**Arachnides :**

Pp. 1- 32.	6. vi. 1838.
- 40.	5. i. 1842.
- 48.	13. vii. 1846.

Pp. 49- 56.	12. xi. 1846.
-106.	14. xi. 1848.

**Annelides :**

Pp. 1- 8.	6. vi. 1838.
- 16.	16. iv. 1839.
- 24.	3. vii. 1841.
- 32.	11. v. 1843.

Pp. 33- 40.	8. xi. 1847.
- 48.	6. vii. 1848.
- 54.	5. i. 1849.

**Zoophytes :**

Pp. 1- 24.	6. vi. 1838.
- 40.	11. x. 1838.
- 48.	16. iv. 1839.
- 64.	12. vi. 1845.
- 72.	13. iv. 1847.
- 80.	2. vii. 1847.

Pp. 80- 88.	8. xi. 1847.
- 96.	14. ii. 1846 !
-104.	14. xi. 1848.
-120.	8. xi. 1847.
-128.	6. vii. 1848.
-160.	13. vii. 1849.

**Insectes (MYR. to COLEOPT.):**

Pp. v-xii.	12. vi. 1845.
1- 8.	6. vi. 1838.
- 16.	13. vii. 1846 *.
- 56.	6. vi. 1838.
- 64.	16. iv. 1839.
- 72.	9. i. 1840.
- 80.	6. x. 1840.
- 88.	3. vii. 1841.
-104.	9. xi. 1841.
-112.	5. i. 1842.

Pp. 113-120.	1. iv. 1842.
-128.	8. xii. 1842.
-148.	9. ii. 1843.
-154.	11. v. 1843.
-202.	10. viii. 1843.
-242.	7. xii. 1843.
-324.	7. iii. 1844.
-402.	5. vi. 1844.
-442.	26. vii. 1844.
-557.	17. i. 1845.

**(ORTHOPT. to DIPT.):**

Pp. 1- 8.	No date.
- 48.	12. vi. 1845.
-144.	11. xii. 1845.
-192.	14. ii. 1846.
-232.	13. vii. 1846.
-320.	12. xi. 1846.
-336.	13. iv. 1847.

Pp. 337-352.	2. vii. 1847.
-360.	8. xi. 1847.
-368.	15. iii. 1848.
-384.	6. vii. 1848.
-392.	14. xi. 1848.
-443.	5. i. 1849.

As neither the plates nor the explanations to plates are dated, I presume they accompanied the text.

\* Obviously imperfections supplied later.

THE ANNALS  
AND  
MAGAZINE OF NATURAL HISTORY.  
[NINTH SERIES.]

No. 60. DECEMBER 1922.

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LIX.—*New or little-known Tipulidæ (Diptera).*—XII. *Australasian Species.* By CHARLES P. ALEXANDER, Ph.D., F.E.S.,  
Amherst, Massachusetts, U.S.A.

THE new species described at this time were collected in various parts of New Zealand by Messrs. Campbell, Harris, Howes, Gourlay, Stuart Lindsay, Oliver, and Watt, as stated in other instalments under this title. My sincere thanks are extended to those collectors who have done so much toward making known the Tipuloidean fauna of New Zealand. The types are preserved in the writer's collection.

*Dicranomyia megastigmosa*, sp. n.

Related to *D. sperata*; stigma very large, especially in the male; cell 1st  $M_2$  open by the atrophy of the outer deflection of  $M_3$ .

*Male*.—Length 6.2 mm.; wing 9.2 mm.

*Female*.—Length 10 mm.; wing 10.8 mm.

Rostrum and palpi black. Antennæ black throughout; flagellar segments oval. Head black.

Mesonotal præscutum grey with a very broad median and less conspicuous lateral brownish-black stripes; scutal lobes black, the median area pale; scutellum pale; postnotum dark, pruinose. Pleura dark, pruinose. Halteres yellow, the knobs dark brown. Legs with the fore and middle coxæ

grey-pruinose, yellow apically; posterior coxæ yellow; trochanters obscure yellow; remainder of the legs black, the femoral bases narrowly obscure yellow. Wings whitish subhyaline, including the costal cell; stigma large, especially in the male, where it fills virtually all of cells 1st  $R_1$ ,  $Sc_1$ , and the base of 2nd  $R_1$ ; in the female, the stigma is smaller, but still much larger than in *D. sperata*; wing-tip broadly infuscated; brown clouds in base of cell  $M$ , the distal ends of the anal cells, and at the anal lobe; veins  $Cu$ ,  $Cu_2$ , and the cord seamed with dusky; anal angle, cell  $R$ , the distal half of cell  $M$ ,  $Cu_1$ , and a large space beyond the stigma whitish subhyaline; wing-base narrowly yellowish; veins dark brown. Venation:  $Sc_1$  ending opposite or beyond mid-length of  $R_s$ ;  $r$  very long and arcuated; cell 1st  $M_2$  open by the atrophy of the outer deflection of  $M_3$ ; basal deflection of  $Cu_1$  a little less than its own length beyond the fork of  $M$ .

Abdomen dark brown, the sternites greyish pruinose. Male hypopygium reddish brown, the fleshy lobe on the ventral face of each pleurite a little stouter than in *sperata*; mesal lobe of gonapophyses more slender than in *sperata*. Valves of the ovipositor slender and straight, but relatively short.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Ben Lomond, Otago, altitude 4000 feet, January 2, 1922 (*G. Howes*).

*Allotopotype*, ♀.

*Paratopotypes*, 3 ♂.

Closely related to *D. sperata*, Alex., differing chiefly in the very large stigma and the open cell 1st  $M_2$ .

### *Molophilus banksianus*, sp. n.

*Male*.—Length 4 mm.; wing 3·4–3·5 mm.

Described from alcoholic specimens.

Closely related to *M. luteipygus*, from which it differs as follows:—

Mesonotal præscutum with three confluent dark brown stripes, the lateral ones of which continue caudad on to the scutal lobes. A broad, yellowish, longitudinal stripe across the ventral pleurites, passing immediately beneath the wing-root, the dorsal pleurites abruptly dark; sternites laterally paler brown. Halteres dark, the knobs pale. Legs pale, the tibiæ and metatarsi tipped with darker. Wings tinged with grey, the stigmal region vaguely darkened. Venation: basal deflection of  $Cu_1$  transverse, straight, so the inner end

of cell  $M_2$  lies a little proximad of that of cell  $Cu_1$ ; vein 2nd  $A$  lying opposite the fork of  $Cu$ .

Abdomen dark brown, the incisures conspicuously pale (in alcoholic material). Male hypopygium with the ventral pleural appendage long and slender, straight, blackened almost to the base, the distal third with appressed but conspicuous chitinated teeth; apex of each pleurite produced into a stout, more or less decurved hook.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Mt. Fitzgerald, Little River, Banks Peninsula, Canterbury, altitude 1500 feet, January 24, 1922 (*E. S. Gourlay*).

*Paratopotype*, ♂.

Associated with *M. luteipygus*, Alex., the two species preyed upon by a small Empidid fly.

*Molophilus pictipleura*, sp. n.

General coloration brown; antennæ short; sublateral margins of præscutum dark brown; pleura yellow with two conspicuous, dark brown, longitudinal stripes; wings broad, light grey, highly iridescent; basal section of  $R_{2+3}$  long, angulated before mid-length; male hypopygium with the basal pleural appendage small, straight, feebly denticulate near apex.

*Male*.—Length about 3 mm.; wing 3.8 mm.

Antennæ short. Head injured in the unique type.

Mesonotal præscutum light yellowish brown, margined sublaterally with dark brown, the lateral margins broadly light yellow. Pleura yellow with a broad dorsal and a narrower ventral dark brown longitudinal stripe, the dorsal stripe about as broad as the yellow stripe ventrad of it. Halteres yellow, the knobs broken. Legs with the coxæ and trochanters yellow; remainder of the legs broken. Wings broad, light grey, highly iridescent, the base and the region of the cord faintly infuscated; veins pale. Venation: basal section of  $R_{2+3}$  long, angulated before mid-length; petiole of cell  $M_2$  a little shorter than the basal section of  $M_{1+2}$ ; vein 2nd  $A$  feebly sinuous, ending about opposite one-fourth the length of the petiole of cell  $M_2$ .

Abdomen dark brown. Male hypopygium with the basal pleural appendage small, straight, stout at base, narrowed to the subacute apex which is feebly denticulate; distal pleural appendage large, the mesal lobe long and straight, acute, the lateral lobe broader, slightly widened distally.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Waipori, Otago, altitude 2000 feet, December 5, 1921 (G. Howes).

*Molophilus flagellifer*, sp. n.

Mesonotum light brown, the pleura dark brown; antennæ short in both sexes; halteres brown, the base and knobs yellow; wings faintly tinged with brown; basal pleural appendage of hypopygium a straight rod that is produced at apex into a long, flagelliform point, directed laterad.

*Male*.—Length about 3.5 mm.; wing 4.3 mm.

*Female*.—Length 4 mm.; wing 4.6 mm.

Rostrum obscure yellow; palpi brownish black. Antennæ short in both sexes, the basal segments obscure yellow, the flagellum pale brown with the bases of the individual segments a little darkened. Head dark brown, the anterior part of the vertex yellow.

Lateral margins of pronotal scutellum yellow. Mesonotum pale brown, the median area of the præscutum slightly darker anteriorly. Pleura and lateral sclerites of postnotum dark brown throughout. Halteres brown, the base of the stem and the knobs yellowish. Legs with the coxæ and trochanters obscure yellow; remainder of the legs brownish testaceous with dark brown trichia. Wings faintly tinged with brown; veins pale brown; macrotrichia dark brown. Venation: vein 2nd *A* elongate, ending beyond mid-length of the first section of  $M_{1+2}$ .

Abdomen dark brown, the sternites paler. Male hypopygium with the basal pleural appendage a stout straight arm that tapers gradually to the apex which is abruptly bent at right angles into a long, acute, chitinized point that is directed laterad.

*Hab.* New Zealand (North Island).

*Holotype*, ♂, Mt. Ruapehu, altitude 3700 feet, January 6, 1922 (M. N. Watt).

*Allotopotype*, ♀.

*Paratopotypes*, 4 ♂ ♀.

*Molophilus niveicinctus*, sp. n.

Mesonotum light brown, the margins of the præscutum broadly sulphur-yellow; knobs of the halteres yellow; legs dark brown, with three broad white rings, two on the tibiae and one before the apex of the metatarsus; basal pleural

appendage of male hypopygium a short straight rod that tapers to the subacute tip.

*Male*.—Length about 2·8 mm.; wing 3·8 mm.

Head broken.

Mesonotum light brown, the margin of the proscutum to the wing-root broadly and conspicuously sulphur-yellow. Pleura dark brown. Halteres pale brown, the knobs conspicuously sulphur-yellow. Legs with the coxæ and trochanters brown; femora dark brown, a little paler at base; tibiæ alternately white and dark brown, the base and a subterminal ring white, the apex and a subbasal ring dark, these four annuli approximately equal in extent; metatarsi dark brown with a broad white ring before the apex, this ring subequal to or broader than the dark base; remainder of the tarsi dark brown. Wings faintly tinged with brown, the costal region more yellowish; macrotrichiae pale brown. Venation: 2nd *A* elongate.

Abdomen dark brown, with conspicuous yellow setæ. Male hypopygium with the basal pleural appendage a short straight rod that tapers to the subacute apex. Distal pleural appendage with a deep U-shaped apical notch.

*Hab.* New Zealand (North Island).

*Holotype*, ♂, Mt. Ruapehu, altitude 3700 feet, January 6, 1922 (*M. N. Watt*).

*Molophilus niveicinctus* is allied to *M. multicinctus*, Edw., and *M. infantulus*, Edw.

*Molophilus lindsayi oliveri*, subsp. n.

*Male*.—Length about 4·5 mm.; wing 5·1 mm.

Described from an alcoholic specimen.

Close to typical *lindsayi*, differing as follows:—

Size larger. Wings with the veins darker and consequently more distinct. *Rs* with a short spur at origin; deflection of *R*<sub>5</sub> conspicuously shorter than *r-m*, transverse in position. Male hypopygium with both appendages terminal in position as in *lindsayi*; lateral appendage almost straight basally, at about one-third the length gently curved, at two-thirds the length strongly curved, just before the tip slightly dilated and thence rapidly narrowed to the acute apex. In typical *lindsayi* this appendage is not conspicuously dilated before the apex, but at this point bears a small but conspicuous appressed tooth.

*Hab.* North Island (South Island).

*Holotype*, ♂, Lake Wakatipu, Otago, December 1921 (F. S. Oliver).

This interesting crane-fly is named in honour of its collector. More material may give this form full specific rank.

*Molophilus gourlayi*, sp. n.

General coloration brown; antennæ of male very long; wings long and narrow, brownish grey; cell  $R_2$  very short-petiolate; male hypopygium with a single small pleural appendage, this terminal in position.

*Male*.—Length about 3.4 mm.; wing 4.2 mm.

Rostrum and palpi testaceous. Antennæ of male very long, about one-half longer than the entire body; scape pale brown; flagellum dark brown, the apical part of each segment shiny black; flagellar segments with approximately the basal half enlarged and provided with conspicuous erect setæ, near mid-length narrowed into a slender neck. Head dark, dusted with grey.

Pronotum laterally obscure yellow. Mesonotum uniformly brown. Pleura obscure brownish yellow. Halteres pale brown. Legs with the coxæ and trochanters obscure yellow; remainder of the legs brown, passing into darker brown on the tarsi. Wings unusually long and narrow, tinged with brownish grey; veins pale brown. Venation: cell  $R_2$  very short-petiolate (instead of sessile, as usual in the genus);  $r$  a little more than its length beyond the fork; basal deflection of  $Cu_1$  at the fork of  $M$ , transverse.

Abdomen brown. Hypopygium with the pleurites stout, with a single pleural appendage, this terminal in position, broad at base, a little narrowed to the blunt apex which is densely set on the mesal face with small spinules. The gonapophyses and penis-guard taken together appear as a roughly quadrangular chitinized mass at the base of the pleurites.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Little River, Mt. Fitzgerald, Banks Peninsula, Canterbury, altitude 1500 feet, January 21, 1922 (E. S. Gourlay).

This interesting crane-fly is named after its collector, Mr. E. S. Gourlay, to whom the writer is indebted for much interesting material from Banks Peninsula and the vicinity of Christchurch. The strict generic position of this very isolated species must be considered as being in doubt. The petiolate cell  $R_2$  would place the fly near *Erioptera*, and it is

possible that more material will demonstrate that a new group is necessary for its reception. A slight proximal shifting of the base of vein  $R_2$  would make a *Molophilus* of this species, as far as venation is concerned, but the male genitalia are not of the strict *Molophilus* type. The antennæ somewhat resemble those of species of *Amphineurus* of the *insulsus* group, but are even more like those of *Molophilus quadrifidus*, Alex.

*Amphineurus gracilisentis*, sp. n.

*Male*.—Length about 4.4–4.8 mm. ; wing 5.3–5.8 mm.

Closely related to *A. otangensis*, differing as follows:—

The component parts of the hypopygium are all unusually long and slender. Ninth tergite with two long parallel lobes, the tips of each obtusely rounded, the notch separating these lobes about as wide as one lobe and of this same general outline. Distal pleural appendage very small, appearing as a slender curved spine, with the lateral spinule (thumb) long, straight, divergent, nearly as long as the slightly stouter apical point. Gonapophyses long and slender, straight, lying parallel to the slender penis-guard, the apex of each a little dilated, each apophysis a little shorter than the guard and closely appressed to it.

*Hub*. New Zealand (North Island).

*Holotype*, ♂, Mt. Ruapehu, altitude 3700 feet, January 6, 1922 (*M. N. Watt*).

*Allotype*, ♀, Ohakune, July 1921 (*T. R. Harris*).

*Paratopotype*, ♂ ; *paratypes*, 10 ♂ ♀, alcoholic, Ohakune, altitude 2060 feet, July 1921 (*T. R. Harris*).

*Amphineurus pressus*, sp. n.

Allied to *A. perdecorus*; wings pale brown, darker in the stigmal area, the macrotrichiae dark; legs unicolorous; cell 1st  $M_2$  present;  $Rs$  square and spurred at origin;  $Sc_2$  before mid-length of  $Sc$ ; male hypopygium with the basal pleural appendage elongate, slender, the margins smooth; gonapophyses approximated basally, bent laterad and gradually narrowed to the blunt tips.

*Male*.—Length about 5 mm. ; wing 5.5 mm.

*Female*.—Length about 5.5 mm. ; wing 6.4 mm.

Rostrum and palpi dark brown. Antennæ dark brown, the apex of the second scapal segment paler. Head dark greyish brown.

Pronotum yellowish laterally. Mesonotum dark brown,



the humeral triangles of the præscutum obscure yellow. Pleura dark brown with patches of flattened white setæ, in the female these more delicate, hair-like, and darker. Halteres yellow, the distal half of the stem darker. Legs with the coxæ and trochanters concolorous with the pleura; legs of the type broken; allotype with the legs pale brownish testaceous, the terminal tarsal segments darker. Wings pale brown, darker in the stigmal area, paler before the stigma and cord; macrotrichia dark brown; veins mostly pale. Venation:  $Sc_2$  far before the origin of  $R_s$ , before mid-length of  $Sc$ ;  $R_s$  square and spurred at origin; cell  $R_2$  sessile or extremely short-petiolate;  $r$  on  $R_2$  about one and one-half times its length beyond the base; cell 1st  $M_2$  small, closed, the veins beyond it elongate; basal deflection of  $Cu_1$  beyond the fork of  $M$ , subtransverse in position, vein 2nd  $A$  elongate, ending opposite or slightly before the level of the fork of  $Cu$ .

Abdomen dark brown. Valves of the ovipositor elongate. Male hypopygium with the pleurites produced into moderately elongate, fleshy lobes that taper to the narrow tips; basal pleural appendage elongate, slender, gently arcuated, the margins smooth, the tip acute. The cephalic distal appendage is slender, the margin microscopically serrulate. Gonapophyses approximated at base, narrowed and strongly arcuated to the blunt tips, which are directed laterad and finally cephalad.

*Hab.* New Zealand (both Islands).

*Holotype*, ♂, South Island, exact locality unknown, but possibly Blackball, Westland (*J. W. Campbell*).

*Allotype*, ♀, Mt. Ruapehu, North Island, altitude 3700 feet, January 6, 1922 (*M. N. Watt*).

### *Amphineurus nox*, sp. n.

*Male*.—Length about 6 mm.; wing 6 mm.

Closely related to *A. campbelli*, differing as follows:—

General coloration black. Rostrum and palpi black. Antennæ broken beyond the scape. Pronotum conspicuously yellow, only narrowly darker in the middle. Mesonotum black, the præscutum with each humeral angle obscure yellow, this elongate-triangular area enclosing the pseudo-sutural foveæ. Pleura black, with a small yellow spot on the mesepimeron. Halteres broken. Legs with the fore coxæ black, the other coxæ brown; remainder of the legs brown. Wings broad, pale brown with conspicuous dark brown macrotrichia. Venation:  $R_s$  long, almost square at

origin;  $R_{2+3}$  very short, less than one-half the basal deflection of  $R_{4+5}$ ;  $r$  on  $R_2$  about its own length beyond the fork; basal deflection of  $Cu_1$  beyond the fork of  $M$ ; cell 1st  $M_2$  relatively small; basal deflection of  $Cu_1$  subtransverse.

Abdomen dark brown, including the hypopygium. Male hypopygium with the pleurites greatly elongated as in *campbelli*, the distal appendages lying at about the basal third. Gonapophyses with the bend deeper than in *campbelli*, the distal point being less extensively chitinized.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Glentui, Canterbury, December 1921 (Stuart Lindsay).

*Gnophomyia* (?) *alpina*, sp. n.

General coloration dark brown; tuberculate pits on the cephalic margin of the conically produced præscutum; legs pale brown, the tarsi black; tibiæ with erect setæ; wings yellowish brown, the stigma darker; basal deflection of  $Cu_1$  beyond mid-length of cell 1st  $M_2$ .

*Female*.—Length about 5 mm.; wing 4.8 mm.

Rostrum and palpi dark brown. Antennæ with the scape black, the flagellum broken. Head black, sparsely pruinose.

Pronotum black medially, obscure brownish yellow laterally. Mesonotal præscutum dark brown medially, paler brown laterally and caudally, sunshiny, the humeral region a little paler; præscutum somewhat conically produced cephalad, the large and conspicuous tuberculate pits located far cephalad on the cephalic margin; remainder of the mesonotum black. Pleura dark brown. Halteres light yellow, the knobs darker. Legs with the fore coxæ dark, the other coxæ pale brown; trochanters obscure yellow; femora and tibiæ pale brown, the tips of the tibiæ and the tarsi abruptly blackened; legs, especially the tibiæ, with very conspicuous outspreading setæ as in *Trimicra* and other genera. Wings with a yellowish-brown suffusion, more yellowish at the base, in the costal region, and along vein  $Cu$ ; stigma oval, brown; veins brown, more yellowish in the region above mentioned. Venation:  $Sc_1$  ending about opposite two-thirds the length of  $Rs$ ,  $Sc_2$  only a short distance from the tip of  $Sc_1$ , the latter alone about equal to the deflection of  $R_{4+5}$ ;  $Rs$  elongate, about in alignment with  $R_{2+3}$ , which is a little arcuated and in alignment with  $R_2$ ;  $r$  faint, a little more than its own length from the tip of  $R_1$  and about one and one-half times its length beyond the fork of  $R_{2+3}$ ; inner ends of cells  $R_3$ ,  $R_5$ , and 1st  $M_2$  in alignment;

cell 1st  $M_2$  elongate, widened distally, a little longer than vein  $M_3$  beyond it; basal deflection of  $Cu_1$  at three-fifths the length of cell 1st  $M_2$ , only a little shorter than  $Cu_2$ .

Abdomen dark brownish black, the tergites a little paler laterally. Ovipositor with the valves long and slender, acicular.

*Hab.* New Zealand (South Island).

*Holotype*, ♀, Ben Lomond, Otago, altitude 4000 feet, January 2, 1922 (*G. Howes*).

The generic reference of this unique fly is provisional only. Certain features of its organization point to *Xipholimnobia*, Alex., of the Ethiopian and Oriental regions.

*Limnophila obliquata*, sp. n.

General coloration yellow; mesonotal præscutum with four dark brown stripes; postnotum with two large dark brown spots on posterior margin; pleura marked with dark brown; femora yellow with two narrow dark brown rings; wings tinged with yellow, with a heavy brown non-ocellate pattern; cell 1st  $M_2$  small; basal deflection of  $Cu_1$  very long and oblique, its origin before the level of the fork of  $M$ , its apex near the distal end of cell 1st  $M_2$ ; abdomen yellow, the lateral margins of the segments with small black dots.

*Female*.—Length 15.5 mm.; wing 13 mm.

Described from an alcoholic specimen.

Rostrum obscure yellow; palpi brown. Antennæ with the scape and basal flagellar segment yellow; remainder of the flagellar segments indistinctly bicolorous, the basal half than the apex; flagellar segments elongate. Head pale brown.

Pronotum yellow. Propleura with a dark brown spot. Mesonotum yellow, the præscutum with four brown stripes, the intermediate pair subcontiguous, broadly obsolete anteriorly; lateral margins of the præscutum infuscated; scutum yellow; the centre of each lobe conspicuously dark brown; scutellum pale yellow; postnotum brownish yellow, the posterior margin with two large, rounded, dark brown spots that are narrowly margined with obscure yellow. Pleura yellow; a conspicuous brown spot on the mesepisternum and another on the sides of the mesosternum between the fore and middle coxæ. Halteres elongate, brown, the knobs yellow. Legs with the coxæ and trochanters yellow; femora brownish yellow basally, the distal half clearer yellow, with two narrow, dark brown, subterminal rings, the distal ring about one-half as wide as the basal ring; tibiæ yellowish

brown; tarsi brown. Wings tinged with yellow, the base, and cells *C* and *Sc* brighter; a heavy, non-ocellate, brown pattern distributed as follows: at *h*; bases of cells *R* and *M*, extending to the costal margin; at origin of *Rs*, extending to *C*; end of *Sc*; conspicuous seams along cord and outer end of cell 1st *M*<sub>2</sub>; spots at forks of *R*<sub>2+3</sub> and *M*<sub>1+2</sub> and at ends of all the longitudinal veins, very large at the ends of the anal veins; most of the longitudinal veins seamed with brown; veins brown, darker in the infuscated areas. Venation: *Sc*<sub>2</sub> longer than *Sc*<sub>1</sub>; *Rs* elongate; *r* about one and one-half times its length from tip of *R*<sub>1</sub>; cell *M*<sub>1</sub> one-half longer than its petiole; cell 1st *M*<sub>2</sub> small, widened distally; basal deflection of *Cu*<sub>1</sub> very long and sinuous, oblique, its origin proximad of the level of the fork of *M* its apex only a short distance from the outer end of cell 1st *M*<sub>2</sub>; cell 2nd *A* comparatively long and narrow; anterior arculus atrophied.

Abdominal tergites orange-yellow, the extreme lateral margins of the basal segments with tiny black dots; sternites similar, with a tiny black dot at the latero-cephalic angle of each sclerite. Elongate tergal valves of the ovipositor dark brown.

*Hab.* New Zealand (North Island).

*Holotype*, alcoholic ♀, Palmerston N., Wellington Province, December 1921.

In spite of the non-ocellate character of its wing-pattern, *Limnophila obliquata* is most nearly related to *L. argus* and allied species.

*Limnophila (Metalimnophila) simplicis*, sp. n.

Male hypopygium simple in structure, the apical mesal angle of the pleurite not produced into a lobe; eighth sternite without a chitinized comb; outer pleural appendage with a chitinized spine on margin before apex.

*Male*.—Length 7 mm., wing 7.3 mm.

Described from an alcoholic specimen.

Rostrum brown, the palpi darker. Antennæ elongate; scape brownish yellow; flagellum dark brown, the incisures very narrowly and indistinctly pale. Head dark brown above, much brighter beneath.

Mesonotum brownish yellow, the præscutum with three darker brown stripes; scutal lobes and base of scutellum brown. Pleura yellow with a dorsal, brown, longitudinal stripe as in the subgenus. Halteres pale. Legs with the coxæ yellow; trochanters brownish yellow; remainder of

legs broken. Wings with a pale greyish-yellow tinge; stigma oval, brown; veins pale brown. Venation:  $Sc_1$  and  $Sc_2$  subequal, ending just beyond the fork of  $R_s$ ;  $R_2$  strongly angulated at origin; cell  $M_1$  only about one-half its petiole; basal deflection of  $Cu_1$  from one-third to one-half the length of cell 1st  $M_2$ .

Abdominal tergites dark brown, the sclerites a little paler apically. Sternites obscure yellow with a large brown blotch at the lateral margin of each sclerite. Male hypopygium of very simple structure for a member of this subgenus, the pleurites not produced into conspicuous lobes at the mesal apical angle and the eighth sternite without a chitinized comb. Outer pleural appendage black, the mesal face densely set with erect setæ which pass into spines near the distal end, the margin before the apex with a powerful chitinized spine; inner pleural appendage pale.

*Hab.* New Zealand (South Island).

*Holotype*, alcoholic ♂, Lake Wakatipu, Otago, December 1921 (*F. S. Oliver*).

*Limnophila* (*Metalimnophila*) *penicillata*, sp. n.

General characters as in *L. howesi*; mesal face of pleurites of hypopygium with a dense brush of yellow setæ; outer pleural appendage truncate at apex.

*Male*.—Length about 5.2 mm.; wing 6.4 mm.

Rostrum and palpi black. Antennæ elongate as in the males of this subgenus, black throughout. Head dark, dusted with tawny anteriorly, more greyish behind.

Mesonotum brown with a tawny pollen, the scutellum and postnotum more pruinose. Pleura grey with a narrow but very distinct, black, longitudinal stripe across the dorsal sclerites. Halteres yellow, the knobs darker. Legs with coxæ concolorous with the pleura; trochanters yellow; remainder of the legs dark brown, the femoral bases a little paler. Wings narrower than in related species, tinged with pale brown; stigma oval, pale brown; veins dark brown. Venation:  $Sc_1$  ending immediately before the fork of  $R_s$ ,  $Sc_2$  at the tip of  $Sc_1$  and equal to it;  $R_s$  arcuated; cell  $R_2$  pointed at base;  $r$  very faint, without macrotrichiae, near mid-distance between the fork of  $R_{2+3}$  and the tip of  $R_1$ ; cell  $M_1$  very small, about one-third the length of its petiole; cell 1st  $M_2$  likewise small, the basal deflection of  $Cu_1$  near the middle of its length.

Abdomen dark brown. Male hypopygium with the pleurites stout, the apical mesal angles only slightly produced;

mesal face of each pleurite with a dense pencil of long yellow bristles, directed caudad and slightly mesad. Outer pleural appendage slender, narrow at base, thence dilated into a narrow blade, the apex truncate; inner pleural appendage slender, straight, the apex obtuse (as in *howesi*).

*Hab.* New Zealand (South Island).

*Hol. type*, ♂, Ben Lomond, Otago, December 30, 1921 (*G. Howes*).

*Gynoplistia luteibasis*, sp. n.

General coloration (in alcohol) dark brown; antennæ 15-segmented, the terminal four segments simple; halteres yellow; legs black, the femoral bases broadly yellow; bases of posterior metatarsi pale; wings subhyaline, the base light yellow, the disk heavily marked with dark brown, this including all of cells *C*, *Sc*, *Sc*<sub>1</sub>, and *M*<sub>1</sub>; gonapophyses of hypopygium appearing as stout, gently curved arms.

*Male*.—Length about 6 mm.; wing 6.2 mm.

Described from an alcoholic specimen.

Rostrum and palpi dark brown. Antennæ 15-segmented, the formula being 2+2+7+4; antennæ dark brown throughout, the longest flabellation being about one-half the length of the flagellum; pectination of ninth flagellar segment nearly twice the segment. Head brown, darker brown medially above.

Mesonotum brown, the præscutum striped with darker brown; a patch of setæ on the lateral margin of the scutum dorso-cephalad of the wing-root. Pleura dark brown. Halteres yellow. Legs with the coxæ dark brown, the fore coxæ a little paler; trochanters light yellow; femora dark brown, the bases broadly light yellow, widest on the fore femora where it includes more than the basal half, narrowest on the posterior femora where a little more than the basal third is included; remainder of the legs black, except the basal half of the posterior metatarsi which is pale. Wings subhyaline, the base conspicuously light yellow; a very heavy brown pattern including all of cells *C*, all of *Sc* except the prearcular portion, all of *Sc*<sub>1</sub>; conspicuous brown areas in base of cell *R*, at origin of *Rs*, scarcely attaining vein *M*; a very broad seam at and beyond the cord, narrowed posteriorly, the centre of cell-1st *M*<sub>2</sub> pale; wing-apex broadly darkened, this including all of cell *M*<sub>1</sub> and the broad outer ends of all the other distal cells; brown clouds in the basal half of cell *Cu* and the broad outer margins of the anal cells; veins dark brown, yellow in the flavous wing-base.

Venation :  $r$  faint, on  $R_2$  near three-fifths the length; cell  $M_1$  shorter than its petiole; basal deflection of  $Cu_1$  near two-thirds the length of cell 1st  $M_2$ ; vein 2nd  $A$  ending some distance before the level of the origin of  $Rs$ .

Abdomen dark brown. Male hypopygium with the apical mesal angle of each pleurite produced into a flattened rounded lobe; outer pleural appendage a broad, flattened, yellow blade. Gonapophyses appearing as stout arms that are curved gently caudad and mesad, their apices blunt.

*Hab.* New Zealand (North Island).

*Holotype*, alcoholic ♂, Palmerston N., Wellington Province, December 1921.

*Gynoplistia aurantiopyga*, sp. n.

General coloration (in alcohol) black, the hypopygium bright orange; antennæ 15-segmented; coxæ black; legs dark brown, the tips of the femora and tibiæ blackened; wings greyish subhyaline, with a rather diffuse brown pattern.

*Male*.—Length 7.5 mm.; wing 6.6–6.8 mm.

*Female*.—Length about 10 mm.; wing 7.8 mm.

Described from alcoholic specimens.

Rostrum and palpi dark brown. Antennæ 15-segmented, the formula being  $2 + 2 + 7 + 4$ , the longest pectination being about two-fifths the length of the flagellum, the pectination of flagellar segment 9 more than twice the length of the segment; antennæ dark brown. Head shiny black.

Mesothorax shiny black. Halteres dusky. Legs with the coxæ black; trochanters obscure yellow; femora obscure yellow, the apices rather broadly blackened; tibiæ yellowish brown, the tips narrowly infuscated; spurs very large; tarsal segments brown, the tips darker, the terminal segments more uniformly darkened. In the female the coxæ are all yellow. Wings greyish subhyaline, with a rather diffuse brown pattern; cells  $C$ ,  $Sc$ , and  $Sc_1$  infuscated; base of cell  $R$  darkened; a circular brown cloud at origin of  $Rs$ ; a large quadrangular area at stigma, continued caudad along the cord, the centre of cell 1st  $M_2$  being largely pale; wing-tip indistinctly darkened; a brown cloud near mid-length of cell  $Cu$ , continued into cell 1st  $A$ ; veins dark brown. Venation:  $R_{2+3}$  very short; cell  $M_1$  a little longer than its petiole; basal deflection of  $Cu_1$  near mid-length of cell 1st  $M_2$ .

Abdomen black, the hypopygium abruptly and very conspicuously orange. Male hypopygium with the apical angle

of the pleurites produced into a small beak-like lobe ; mesal face of pleurite produced caudad and mesad into a lobe ; apex of inner pleural appendage slender. Gonapophyses appearing as rods that are shaped somewhat like boomerangs, bent near mid-length, the distal ends obtuse.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Lake Wakatipu, Otago, December 1921 (F. S. Oliver).

*Allotopotype*, ♀.

*Paratopotype*, ♂.

*Gynoplistia bidentata*, sp. n.

General coloration shiny black, sometimes faintly greenish black or blue-black, especially on the abdomen ; antennæ 15-segmented, the terminal five segments simple ; male hypopygium with the gonapophyses deeply bifid at tips.

*Male*.—Length about 6.5–7 mm. ; wing 5.6–6.2 mm.

*Female*.—Length about 8 mm. ; wing 6 mm.

Rostrum and palpi black. Antennæ 15-segmented, the formula being  $2+2+6+5$ , the longest flabellation about two-fifths the length of the flagellum ; antennæ entirely black. Head shiny black.

Mesonotum shiny black. Pleura black, with a patch of greyish-yellow pubescence on the mesepisternum. Halteres pale, the knobs a little darker. Legs with the fore coxæ black, the other coxæ brownish black ; trochanters brownish black ; femora obscure yellow basally, black apically, the yellow most extensive on the posterior legs, where only the apices are darkened ; remainder of the legs black ; posterior tarsi uniformly dark. Wings greyish subhyaline ; cell *Sc* infuscated ; a rather sparse dark brown pattern as follows :—A circular area at origin of *Rs*, not attaining vein *M* in the male, barely reaching this vein in the female ; a relatively narrow seam from the stigma along the cord and outer end of cell 1st *M*<sub>2</sub> ; wing-tip faintly darkened ; a more or less distinct cloud at fork of *M*<sub>1+2</sub> ; faint clouds in outer ends of cells *Cu*<sub>1</sub> and *Cu*, at mid-length of vein *Cu*<sub>1</sub> and in cell 2nd *A* ; veins dark brown. Venation : cell *M*<sub>1</sub> slightly variable in size, approximately equal to its petiole ; basal deflection of *Cu*<sub>1</sub> beyond mid-length of cell 1st *M*<sub>2</sub>.

Abdomen blue-black, the hypopygium a very little paler. Male hypopygium with the apex of each pleurite produced into two flattened lobes, one smaller and more obtusely rounded than the other ; gonapophyses deeply bifid, the lateral tooth about twice the length of the mesal tooth ;



penis-guard broad-based, tapering rapidly to the slender apex. Ovipositor elongate, slender, reddish horn-colour.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Ben Lomond, Otago, altitude 4000 feet, January 2, 1922 (*G. Howes*).

*Allotopotype*, ♀, December 30, 1921.

*Paratopotypes*, 7 ♂ ♀, with the types.

*Gynoplistia bidentata purpurea*, subsp. n.

*Male*.—Length about 7 mm.; wing 7·2 mm.

Generally similar to typical *bidentata*, differing as follows:—

Size larger. Pectinations of flagellar segments longer, the longest more than one-half the length of the flagellum. Pubescence of mesepisternum silvery grey in colour, appearing as a narrow oblique line. Legs longer and more slender. Wings with the apex distinctly clouded; clouds in the outer ends of cells *Cu*, *Cu*<sub>1</sub>, 1st *A*, where it is very large, and a small spot in the extreme end of cell 2nd *A*. Abdomen with intense purplish-blue reflections. Male hypopygium with the extreme tip of the outer pleural appendage slightly knobbed; mesal face of pleurites less densely setiferous.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Glentui, Canterbury, December 1921 (*S. Lindsay*).

*Gynoplistia bidentata* differs from all similar species with 15-segmented antennæ by the structure of the gonapophyses.

*Macromastix mesocera*, sp. n.

General coloration brown, the præscutum with three dark brown stripes; antennæ of male as long as the head and thorax taken together; setæ on thorax short; wings infumed, especially at base and in costal region.

*Male*.—Length 12 mm.; wing 14·2 mm.; antenna about 5 mm.

Frontal prolongation of the head and the palpi dark brown. Antennæ moderately elongate, about as long as the head and thorax taken together, dark brown, the second segment obscure yellow. Head rich fulvous, the vertical tubercle entire; a narrow pale margin adjoining the inner margin of the eye.

Mesonotal præscutum pale brown, with three conspicuous dark brown stripes, of which the median stripe is very indistinctly split by a pale line; scutum pale brown, the lobes

conspicuously marked with darker brown; scutellum and postnotum light brown, the posterior margin of the latter darker. Thorax with very short setæ. Pleura grey, variegated with brown, especially on the ventral sclerites; dorso-pleural membrane obscure yellow. Halteres brown, the knobs obscure brownish yellow. Legs with the coxæ brown; trochanters greenish; femora yellowish brown, the tips rather narrowly but conspicuously blackened; tibiæ pale yellowish brown, the tips very narrowly blackened; basal tarsal segment bright brown, the terminal segments blackened. Wings strongly infumed, the caudal margin fading into grey; wing-base and cells *C* and *Sc* darker brown; stigma oval, dark brown; a conspicuous brown cloud on the basal deflection of  $R_{4+5}$  and  $r-m$ ; a brown cloud in the centre of cell *R*; a very small pale area before the stigma; veins dark, the tips of the medial and anal veins subobsolete. Venation: cell 1st  $M_2$  narrowed distally; petiole of cell  $M_1$  a little less than twice the length of  $m$ ;  $m-cu$  distinct; cell 2nd *A* broad.

Abdominal tergite 1 and the lateral margins of 2 reddish yellow, the median area dark brown; remaining tergites shiny dark brown, the caudal margins of the segments narrowly blackened; hypopygium dark.

*Hab.* New Zealand (South Island).

*Holotype*, ♂, Dunedin, Otago, December 22, 1921 (*G. Howes*).

LX.—*Exotic Muscaridæ (Diptera)*.—VIII.\* By J. R. MALLOCH, Bureau of Biological Survey, Washington, D.C.

#### Subfamily PHAONIINÆ.

#### Genus XENOSIA, Malloch.

I erected this genus for the reception of one species, *ungulata*, Stein. In my original definition of the genus, I included the presence of fine hairs on the upper margin of the hypopleura in front of the spiracle as one of the characters of the genus. This applies to the genotype, but not to *morosa*, Stein, which I consider may properly be located in this genus. This character, therefore, must be eliminated.

\* For Part VII., see *Ann. & Mag. Nat. Hist.* (9) x., October 1922, pp. 379-391.

*Xenosia ungulata* (Stein).

One male, Punkullam, Ceylon, 13. iii. 1891 (*J. W. Yerbury*).

This specimen has a dense covering of mites on the ventral surface and on the sides of the thorax anteriorly and posteriorly.

*Xenosia morosa* (Stein).

A bluish-black species with greyish pruinescence on thorax and abdomen; the antennæ and palpi fuscous, and the legs yellow. The antennæ are long and rather slender, the third segment about four times as long as second, and the arista is much shorter-haired than in *ungulata*. The anterior intra-alar bristle is absent as in that species, the scutellum has some fine hairs on sides below, and the setulæ on first vein are confined to the basal half of the vein.

Three females, Nuwara Eliya, Ceylon, 6. v. 1891, and 12. and 13. vii. 1892 (*J. W. Yerbury*).

This species was originally described from Ceylon.

The genus *Myographa*, Malloch, has the first vein setulose, but on the apical instead of the basal half, and the arista is pubescent, not plumose. I inadvertently cited the genotype as *intonsa*, Stein, instead of *tonsa*, Stein. There is no such species as *Limnophora intonsa*, Stein. This genus is more nearly related to *Limnophora* than to *Helina*.

*Helina fuscoflava*, Malloch.

One female, Victoria, Australia (*C. French*).

African *Cænosiinæ*.

This subfamily is very well represented in Africa both as to genera and species. The adults are, so far as I know, predacious, feeding upon small insects of other orders and Diptera, especially small Nematocera. The larvæ of some species feed in much decayed wood, especially tree-stumps, and others feed in rotting fruit. The genus *Atherigona*, which is cosmopolitan in its distribution, is very commonly found in Africa, but it is very difficult to identify the described species as they have been described on colour-characters almost entirely. I hope to give some time to the study of this genus next, and find some means of working out the forms available to me.

The subfamily, as at present understood, has the following

characters:—Eyes in both sexes widely separated; thorax usually with one pair of strong presutural dorso-central bristles, if with two pairs there are but three pairs of post-suturals, the lower stigmatal bristle is directed downward, and there is but one antero-dorsal bristle on middle of hind tibia; scutellum with at most four strong marginal bristles, the smaller preapical bristles absent; sixth wing-vein short; scutellum without any soft ventral hairs; lower calyptra larger than upper, sometimes inconspicuously so.

*Key to Genera in Africa.*

1. Thorax with two pairs of strong postantural dorso-central bristles; lower calyptra but little larger than upper ..... 2.  
     Thorax with three pairs of postantural dorso-central bristles; lower calyptra usually much larger than upper..... 4.
2. Costal vein ending at or slightly beyond apex of third vein; mid-tibia with a long bristle at base ..... *Tenuicosta*, Stein.  
     Costal vein continued to apex of fourth vein ..... 3.
3. Scutellum with four strong bristles; fore tibiae of males feathered ..... *Anaphalantus*, Loew.  
     Scutellum with but two strong bristles; fore tibiae of males not feathered ..... *Microcalyptra*, Stein.
4. Scutellum with but two strong bristles; fore tibiae unarmed at middle..... 5.  
     Scutellum with four strong bristles ..... 6.
5. Hind tibia with one long and one short antero-ventral bristle; thorax with one pair of presutural dorso-central bristles.. *Orcilus* a, Rondani.  
     Hind tibia with at most one short antero-dorsal bristle; thorax with two pairs of presutural dorso-central bristles..... *Spanochæta*, Stein.
6. Costal vein ending at apex of third vein .. *Brevicosta*, Malloch.  
     Costal vein continued to apex of fourth vein ..... 7.
7. Anterior thoracic dorso-centrals very short, but little longer than the adjacent setulose hairs; fore femur with one or two bristles near apex on postero-ventral surface ..... *Atherygona*, Rondani  
     Anterior thoracic bristles long and strong, well differentiated from any minute setulæ that may be present; fore femur with a complete series of bristles on postero-ventral surface ..... 8.
8. Hind tibia with one or two strong bristles on postero-dorsal surface near middle .. 9.  
     Hind tibia without bristles on postero-dorsal surface near middle ..... 10
9. Hind tibia with two bristles on postero-

- dorsal surface; median two bristles on each orbit very close together..... *Pygophora*, Schiner.
- Hind tibia with one median postero-dorsal bristle; bristling of orbits normal ..... *Cænosa*, Meigen, pt.
10. Hind tibia with two very long bristles at middle, the bases of which are very close together, one on the antero-dorsal and the other on the anterior or antero-ventral surface..... *Caricea*, Rob.-Desv.
- Hind tibia with one long strong bristle on antero-dorsal and a weaker bristle on the antero-ventral surface, the latter nearer apex than the former ..... *Cænosa*, Meigen, pt.
- Hind tibia with two antero-dorsal and two antero-ventral bristles near middle; lower calyptra hardly produced ..... *Schonomyza*, Haliday.

### Key to Species of *Cænosa* and *Caricea*.

1. Legs black; fore and mid coxæ whitish; antennæ pale yellow ..... *albicoxa*, Stein.
- Legs black, at most the bases of tibiæ narrowly yellowish ..... 2.
- Legs yellow; if largely black, the tibiæ are always yellow at least at bases, and the femora are usually basally, always so if the tibiæ are blackened apically..... 14.
2. Halteres black or dark brown ..... 3.
- Halteres yellow..... 7.
3. Arista distinctly short-haired on basal half; calyptræ whitish; antennæ black ..... *nodosa*, Stein.
- Arista pubescent or bare ..... 4.
4. Third antennal segment yellow; without a sharp upper anterior angle at apex; calyptræ whitish ..... *canifrons*, Stein.
- Antennæ black ..... 5.
5. Calyptræ whitish; antennæ with a pointed upper angle at tip; frons seen from in front with dense whitish pruinescence .. *præacuta*, Stein.
- Calyptræ brown or fuscous ..... 6.
6. Frons seen from in front densely white pruinescent ..... *niveifrons*, Stein.
- Frons seen from in front black or grey .... *fumisquama*, Stein.
7. Arista with short pubescence or nearly bare; calyptræ very unequal in size; frons densely whitish-grey pruinescent.. 8.
- Arista with distinct but not very long hairs; frons not densely whitish-grey pruinescent ..... 9.
8. Abdomen with a dorso-central vitta and paired spots on dorsum black; legs black ..... *planifrons*, Stein.
- Abdomen grey pruinescent, immaculate; knees yellow ..... *diluta*, Stein.
9. Wings whitish on basal half, more or less conspicuously blackened on apical half;

- lower calyptra much protruded; abdomen greyish pruinose, opaque, with paired dorsal black spots. .... 10.
- Wings unicolorous hyaline. .... 11.
10. Paired black spots on dorsum of abdomen fused, large, and rather poorly defined; apical half of wing very conspicuously blackened; fifth sternite in male entirely opaque grey pruinose. .... *semifumosa*, Stein.
- Paired black spots on dorsum of abdomen widely separated, sometimes indistinct; apical half of wing inconspicuously infuscated; inner half of each process of fifth abdominal sternite of male shining, outer half opaque grey pruinose. .... *semialba*, sp. n.
11. Lower calyptra barely protruded beyond upper; abdomen with grey pruinescence, and dorso-central vitta and paired spots black. .... *fullax*, Stein.
- Lower calyptra protruded very much beyond upper. .... 12.
12. Abdomen glossy black, with grey pruinescence on each tergite at the anterior lateral angle on dorsum, not with distinct paired spots. .... 12 a.
- Abdomen opaque grey pruinose with paired spots and sometimes a central vitta on dorsum. .... 13.
- 12a. Legs black; arista quite distinctly haired. Knees and bases of tibiae yellow; arista with short pubescence. .... *pilifemur*, Stein.
13. Bases of fore tibiae narrowly pale yellowish; male without series of median spots on dorsum of abdomen; outer cross-vein of wing at not more than its own length from apex of fifth vein. .... *fascigera*, Stein.
- Fore tibiae black; male with a very distinct series of black spots on middle of dorsum of abdomen; outer cross-vein of wing at distinctly more than its own length from apex of fifth. .... *semialba*, sp. n.
14. Arita with exceptionally long hairs, the longest about as long as length of third antennal segment. .... 15.
- Arita short-haired or pubescent, the longest hairs never much more than as long as width of third antennal segment. .... 16.
15. Femora yellow, sometimes a small blackish mark at apices of hind pair. .... *longiseta*, Stein.
- Femora black. .... *angustifrons*, Stein.
16. All femora black, sometimes yellowish at apices. .... 17.
- At least some portion of basal half of femora yellowish. .... 20.
17. Tarsi pale yellow. .... *ochroprocta*, Spieser.
- Tarsi black. .... 18.

18. Antennæ falling much short of lower margin of eyes ..... *humilis*, Meigen.  
 Antennæ extending at least to lower margin of eyes ..... 19.
19. Hind tibiæ with fine setulæ on almost the entire ventral surface; thorax usually with a brown median vitta ..... *trichacnema*, Stein.  
 Hind tibiæ without fine setulose ventral hairs; thorax not vittate ..... *inanis*, Stein.
20. Tibiæ largely black; wings slightly and evenly brownish ..... *fumipennis*, Stein.  
 Tibiæ yellow; wings hyaline ..... 21.
21. Abdomen more or less translucent yellow at base ..... *dorsalis*, v. Roser.  
 Abdomen not yellowish at base ..... 22.
22. Vibrissæ yellow ..... *flavovibrissata*, Stein.  
 Vibrissæ black ..... 23.
23. Hind tibia in both sexes with a postero-dorsal bristle and an antero-dorsal bristle at middle, the female with an antero-ventral bristle also; arista almost bare; thorax with three broad brown vittæ, the median one carried over disc of scutellum ..... 24.  
 Hind tibia lacking the postero-sutural bristle ..... 25.
24. Third antennal segment attenuated apically, gradually tapered to apex, the underside without a rounded angle, the upper terminating in a sharp point; dorsum of thorax chocolate-brown, that of abdomen similarly coloured except at anterior lateral angles of tergites where there are small grey-pruinose triangular marks; all femora with a blackish stripe above apically ..... *attenuicornis*, sp. n.  
 Third antennal segment normal, not distinctly tapered to apex; thorax not as above ..... 24 a.
- 24a. Ocellar bristles about two-thirds as long as frons; bristles on basal half of antero-ventral and postero-ventral surfaces of mid-femur long and strong; all femora largely infuscated, pale at bases and apices ..... *fuscifemur*, sp. n.  
 Ocellar bristles about one-third as long as frons; bristles on basal half of postero-ventral and antero-ventral surfaces of mid-femur very short and weak; femora almost entirely clear rufous yellow .... *vittata*, Wiedemann.
25. Thorax with a very broad brown vitta on each side of disc which is carried over anterior lateral angle of scutellum, and a very fine median brown line which is neither contiguous with lateral vitta nor

- continued over disc of scutellum; anterior bristle on middle of hind tibia apical of the antero-dorsal one..... *inæquivitta*, sp. n.
- Thorax with the vittæ not as above, the anterior lateral angles of scutellum never darker than the disc ..... 26.
26. Cross-veins of wings slightly but distinctly infuscated; arista bare; small species, 3.5 mm. in length..... *costata*, Stein.
- Cross-veins of wings not infuscated ..... 27.
27. Third antennal segment pale yellow; small species, about 1.3 mm. in length ..... 28.
- Third antennal segment not yellow ..... 29.
28. Fore and mid tibiæ without bristles at middle ..... *dorsalis*, v. Roser.
- Fore and mid tibiæ with the normal median bristles ..... *longitarsis*, Stein.
29. Hind tibia with only the antero-dorsal bristle at middle ..... *venia*, sp. n.
- Hind tibia with the usual two bristles at middle ..... 30.
30. Large species, averaging over 5 mm. in length ..... 31.
- Small species, not over 4 mm. in length .. 34.
31. Fore femora entirely yellow; arista short-haired ..... *similis*, Stein.
- Fore femora partly blackened; arista distinctly pubescent ..... 32.
32. Thorax indistinctly vittate laterally; third antennal segment much longer than distance from its apex to mouth-margin; anterior sterno-pleural bristle long and strong..... *natalia*, sp. n.
- Thorax conspicuously vittate laterally; third antennal segment as long as distance from its apex to mouth-margin; anterior sterno-pleural bristle short and weak ..... 33.
33. Hind tibia with the anterior bristle but slightly basad of the antero-dorsal one; fore femur with a black dorsal mark on apical third; median vitta not continued over scutellum..... *atroapicata*, sp. n.
- Hind tibia with the anterior bristle very distinctly basad of the antero-dorsal one; fore femur with a black streak on postero-dorsal surface from base to apex; median vitta continued over scutellum.. *calopoda*, Bezzi.
34. Arista with its longest hairs about as long as width of third antennal segment; abdomen with distinct paired spots and median vitta on dorsum ..... *punctigera*, Stein.
- Arista barely pubescent ..... 35.
35. Mid and hind femora on antero-ventral surface on their entire length with long



- bristles and short and fine hairs; abdomen with distinct paired spots and median vitta on dorsum ..... *strigulipes*, Stein\*.  
 Mid and hind femora with only sparse setulose hairs ventrally; abdomen without distinct dorsal markings ..... *attenuata*, Stein.

Wherever the descriptions of the species have permitted me to do so I have included them in the key, but several African species are so poorly described that this has been found impossible. Those omitted are as follows:—*cyclophthalmia*, Thomson, *flavipes*, Adams, *inversa*, Wiedemann, *punctipes*, Thomson, *multimaculata*, Adams, *sex-notata*, Adams, and *trichopyga*, Loew.

*Cænosiæ punctipes*, Thomson.

This species belongs to the same group as *similis*, Stein, but from Stein's re-description I cannot place it satisfactorily, though it will run to *similis* in the key given here. It differs in having the femora all yellow.

*Cænosiæ humeralis*, Stein.

This specific name, *humeralis*, was preoccupied by *humeralis*, Wiedemann, when Stein used it for his species and the name *acromiata* was proposed to replace that of Stein's species by Speiser. Though the Wiedemann species has been removed to *Atherigona* and Stein's is a *Pygophora*, still the two were described as *Cænosiæ* species, and the name *acromiata*, Speiser, must take the place of *humeralis*, Stein, in *Pygophora*. I have several times referred to Stein's species under the specific name *humeralis*, having failed to note until recently that the name had been changed by Speiser.

With respect to preoccupied names, it may be well to note that the specific name *flavipes* has been used three times in this genus, the last time by Adams for an African species, a fact which will prevent the renaming of that species should it have been subsequently described under another name.

*Caricea fumisquama* (Stein).

A deep black species, with fuscous calyptræ and halteres, infuscated wings, and the thorax and abdomen without markings. Arista pubescent; frons flat and appearing

\* This is the species also listed under the name *cingulipes*, Zetterstedt, by Stein.

microscopically granulos<sup>c</sup>; the orbital bristles three, long, but not strong. Anterior sternò-pleural short. Anterior median hind tibial bristle slightly basad of the antero-dorsal one, both basad of middle. Eyes covering almost the entire side of head.

Length 3 mm.

One female, Obuasi, Ashanti, 4. viii. 1907 (*W. M. Graham*).

*Caricea pilifemur* (Stein).

One pair *in copula* and one female, Ulundi, Natal, ix. 1896, 5000–6500 feet (*G. A. K. Marshall*).

A very distinctly shining black species, which is distinguished, as stated in the key, by the markings on the abdomen.

*Caricea semifumosa* (Stein).

A very striking species. Entirely black, densely grey-pruinose, the thorax not vittate, and the abdomen with the fuscous paired spots fused. Wings white on basal half, black on apical half. Median long bristles on hind tibia at same height; fore femur with a series of fine short antero-ventral bristles on basal two-thirds which are longest at base; anterior sternò-pleural bristle long; frons very narrow, not over one-fifth as wide as head at centre in male, the bristles fine and short; longest hairs on arista as long as width of third antennal segment.

Length 4 mm.

Four males, Willow Grange, Natal (*R. C. Wroughton*).

*Caricea semialba*, sp. n.

*Male and female*.—A larger species than the last and more robust, the wings of female not infuscated, and those of male rather inconspicuously so. Other distinguishing characters as stated in key. The chætotaxy of the legs is similar to that of the last species, but the bristles are longer and stronger, and those on antero-ventral surface of hind femur are more numerous, forming an almost complete, if sparse, series. The frons is about as wide as length of antenna, while in *semifumosa* it is distinctly narrower; lower and anterior sternò-pleural bristles much shorter than upper.

Length 4–5 mm.

*Type*, male, allotype, and two male paratypes, Ulundi, Natal, ix. 1896, 5000–6500 feet (*G. A. K. Marshall*). One female paratype, Willow Grange, Natal (*R. C. Wroughton*).

*Caricea tripunctiventris*, sp. n.

*Male*.—A smaller species than either of the preceding two, with hyaline wings, the fore tibia not pale yellow at base, the abdomen almost cylindrical and with paired spots and a fuscous median vitta on dorsum black. The arista has shorter hairs than in the last species, the antennæ extend farther towards mouth-margin, the third segment is slightly pointed at apex above. In other respects the head is similar to that of *semialba*. The hypopygium is larger than in that species, being slightly knob-like, the abdomen is not compressed, and the outer cross-vein of wings is about one-third from apex of discal cell, which is much closer to apex than in *semialba*.

Length 3.5 mm.

*Type*, Mt. Mlanje, Nyasaland, 16. vi. 1913 (*S. A. Neave*).

A female which is marked, as is the male, may probably represent another species. The arista has longer hairs, the sterno-pleural bristles are all long and strong, and the inner cross-vein is but little beyond middle of discal cell, while the outer one is even farther from apex of fifth vein than in *semialba*.

Locality, Durban, Natal (*F. Muir*).

*Caricea longiseta* (Stein).

Differs from all the preceding species in having the femora and tibiæ yellow, only the extreme apices of the hind femora being black, and the coxæ are yellow. The antennæ are black, and palpi yellow. Thorax indistinctly vittate. Abdomen marked with a series of central spots and paired lateral spots black. Longest hairs on arista about as long as third antennal segment. Anterior sterno-pleural bristle long and strong; median fore tibial bristle very long, median hind tibial bristles very long and transversely placed.

One male from Sierra Leone differs in having the apex of third antennal segment and all of fore coxæ except extreme bases yellow.

Length 5 mm.

I have before me a series of specimens from Ashanti, Sierra Leone, Southern Nigeria, Uganda, Northern Nyasa, and Durban, Natal.

*Caricea fumipennis* (Stein).

Differs from *atroapicata* in having the median bristle on hind tibia slightly apicad of the antero-dorsal one. Legs with the exception of the trochanters, basal half of mid and hind femora, and the extreme bases of tibiæ black. The wings are rather noticeably browned. Abdomen with a large fuscous mark on each tergite which covers the entire posterior dorsal margin and extends to anterior margin in centre more or less broadly. The fore femora are less setulose antero-ventrally than in *atroapicata*.

Length 6 mm.

One female, north of Mt. Kenya, Kenya Colony, 18. ii. 1911, 8300 feet (*T. J. Anderson*).

As the thorax is vittate, it is almost impossible to locate this species correctly by using Stein's key to the African species (1913).

*Caricea vittata* (Wiedemann).

This species differs in the colour of the face in the sexes, the female having it whitish-grey and the male almost golden-yellow. The femora are without black marks, except at extreme apices of the hind pair. The difference in chaetotaxy of the hind tibiæ in the sexes is very remarkable, the lack of the antero-ventral bristle in male when it is present in female being unique in my experience, and it may not apply to the following species, though I have listed them that way in the key.

Length 4-5 mm.

Localities, four specimens, Ulundi, Natal, ix. 1896, 5000-6500 feet, and two specimens, Estcourt, Natal, ix.-x. 1896 (*G. A. K. Marshall*); one specimen, Willow Grange, Natal (*R. C. Wroughton*).

This and the next species may be referred, with a slight doubt, to my genus *Neodexiopsis*.

*Caricea fuscifemur*, sp. n.

*Female*.—Very closely related to *vittata*. Differs in having the femora largely fuscous, the abdominal spots larger and darker, a more conspicuous dark area on mesopleura, the lower calyptra larger, the outer cross-vein at about its own length from apex of fifth instead of half that length, as well as stated in key.

Length 5 mm.

*Type*, Embu, Kenya Colony, 20. ii. 1914 (G. St. Orde Browne).

*Caricea attenuicornis*, sp. n.

*Female*.—Dorsum including frons chocolate-brown, the frons opaque, thorax and abdomen shining, the former slightly so; face, pleura, and lateral margins of abdominal tergites whitish pruinose, that on tergites extending towards the middle on the anterior margins, but not entirely over dorsum. Antennæ black, palpi fuscous. Legs yellow; mid and hind coxæ, a streak along dorsal surfaces of fore femora, and the apices of mid and hind femora infuscated.

Eyes covering almost the entire side of head, facets much enlarged in middle close to face; frons flat, bristles rubbed off in type; antennæ long and slender, inserted above middle of profile, third segment tapered to apex, tip acute; arista with its longest hairs as long as its basal width; parafacial and cheek linear. Anterior and lower sterno-pleural bristles short, a long setulose hair between upper and lower bristles as in some of the other species. Tibial bristles very long, the pair on hind tibia at middle transverse. Inner cross-vein at middle of discal cell, outer one a little more than its own length from apex of fifth vein.

Length 6 mm.

*Type*, South-east edge of Kenya Forest, Kenya Colony, 7. ii. 1911, 5000–6000 feet (T. J. Anderson).

*Caricea inæquivitta*, sp. n.

*Male and female*.—Black, densely yellowish-grey pruinose. Head black, orbits grey; antennæ black; palpi dark brown. Thorax with a linear median vitta and a very broad one on each side of it dark brown, the vittæ nowhere confluent, the lateral pair continued over anterior lateral angles of scutellum; mesopleura brown above. Abdomen with median and lateral brown spots on dorsum. Legs yellow, fore femora almost entirely, mid and hind pairs dorsally and apically blackened; tarsi brown.

Longest hairs on arista about as long as width of third antennal segment. Anterior sterno-pleural bristle very short and weak; basal pair of marginal scutellar bristles much shorter than the apical pair. Abdomen of male cylindrical, the hypopygium small, fourth sternite with two or three long hairs apically, processes of fifth sternite with

fine short hairs and some longer setulæ; abdomen of female tapered apically, apical tergite with very short bristles. Tibial bristles long; anterior and antero-dorsal pair not at same height, the former apicad slightly. Fourth wing-vein in male conspicuously thickened proximad of the inner cross-vein to base of discal cell, not abnormal in female; inner cross-vein at or slightly before middle of discal cell.

Length 7 mm.

*Type*, female, allotype, and four paratypes, Nakuni, Kenya Colony, i. 1913 (*B. L. van Someren*). Paratypes, two females, Mogorr River, Kenya Col., v. 1913 (*Capt. A. O. Luckman*); one female, Kabete, Kenya Col., 17. ii. 1918, and one female, west of Mt. Kenia, 19-20. ii. 1911, 6500-7250 feet (*T. J. Anderson*).

*Cœnosia xenia*, sp. n.

*Male*.—An aberrant species, distinguished by the absence of the anterior bristle from middle of hind tibia.

Black, densely grey-pruinose. Head black, frons almost velvety, deep black, orbits grey; antennæ and palpi black. Thorax greasy in type, but evidently vittate. Abdomen with large but not clearly defined lateral spots and median vitta on dorsum black. Legs including fore coxæ yellow, fore femora with a black streak on apical half above, mid and hind femora with about the apical third black; tarsi fuscous. Wings hyaline.

Frons nearly one-third of the head-width; antennæ falling considerably short of the mouth-margin, third segment acute above at apex; arista very short pubescent. Abdomen compressed, hypopygium small, fifth sternite with inner half of each process shining and furnished with long fine hairs; fore and mid tibia with the normal bristles small; hind femur with long fine hairs on basal half of postero-ventral surface, and two or three short, widely separated bristles on antero-ventral surface; hind tibia with a short antero-dorsal bristle at middle. Inner cross-vein just beyond middle of discal cell, outer at its own length from apex of fifth vein.

Length 5 mm.

*Type*, Ulundi, Natal, ix. 1896, 5000-6500 feet (*G. A. K. Marshall*).

*Caricea natalia*, sp. n.

*Female*.—Similar in colour and habitus to *atroapicata*, differing as stated in key.

The longest hairs on arista are distinctly longer than its basal diameter, the third antennal segment is produced into a sharp point at apex above, and falls short of mouth-margin by a distance about equal to its width; there is a strong bristle above the vibrissa; all the sterno-pleurals are strong, and the median pair of bristles on hind tibia are transversely placed.

Length 7 mm.

*Type*, Willow Grange, Natal (*R. C. Wroughton*).

*Caricea calopoda* (Bezzi).

A very striking species. Fore femur with a long dorsal stripe, and mid and hind femora with a dorsal stripe on apical third or more fuscous; tarsi fuscous. Thorax with three almost confluent dark brown vittæ, and a series of elongate brown spots at bases of dorso-centrals, the median vitta extending to anterior margin and over disc of scutellum; abdomen with a series of elongate dorso-central spots and lateral spots on each segment dark brown. Arista very short-haired; anterior sterno-pleural bristle very weak and short; basal sternite bare; basal half of antero-ventral and ventral surfaces of fore femora rather conspicuously setulose.

Length 7 mm.

I have before me two females from the edge of the forest on the east side of the Aberdare Mts., Kenya Colony, 24. ii. 1911, 7300 feet (*T. J. Anderson*).

*Caricea atroapicata*, sp. n.

*Male and female*.—Similar to the preceding species in general colour, the antennæ black, palpi fuscous basally, blackened apically. The thoracic vittæ are similar, but the median one is not carried over disc of scutellum. The fore femur has the black dorsal stripe broader and present only on the apical half. The median bristles on hind tibiæ are closer together than in *calopoda*, the anterior one being but little basad of the antero-dorsal one, while in *calopoda* it is very distinctly so. The fore and hind tibiæ are also more distinctly hairy. The male has one or two very fine outstanding hairs near apices of basal two segments of hind tarsi on anterior side. Hypopygium small; fifth sternite with rather dense short hairs along margins of processes.

Length 6 mm.

*Type*, male, Kondoa Itangi, Tanganyika Territory, 12. vi. 1916, 4400 feet (*W. A. Lamborn*). Allotype, Ufomi, Tanganyika Terr., 6. vi. 1916. One male paratype, same data as allotype (*W. A. Lamborn*).

*Caricea longitarsis* (Stein).

One female I identify as this from Port Natal.

*Caricea strigulipes* (Stein).

Two males and one female, Port Natal (*Plant*).

*Cænusia acuticornis* (Stein).

A typical *Cænusia*, belonging to the same group as most of the European and North American species. Very well distinguished by the fusion of the three brown thoracic vittæ into a broad stripe, which extends over disc of scutellum. Abdomen with paired dark spots; tibiæ tawny; antennæ and palpi black.

Originally described from Victoria. I have before me a series from Burpengary, Queensland, and Tasmania.

LXI.—*Fishes of the Clupeid Genera Clupeoides and Potamalosa, and allied Genera.* By C. TATE REGAN, M.A., F.R.S.

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IN former papers on the Clupeidæ I have revised most of the fishes included by Günther in the genera *Clupea*, *Chatoessus*, and *Pellonula*. The remaining Clupeinæ are here dealt with, except the genera with a long anal fin.

*Synopsis of the Genera.*

## A single supramaxillary (supplemental bone).

## I. No mid-dorsal series of scutes.

## A. Anal fin without finlets.

Abdominal serrature beginning at isthmus..... 1. *Kowale*.

Abdominal serrature beginning behind thorax ..... 2. *Clupeoides*.

## B. Anal fin followed by two finlets.

Mouth normal; teeth minute ..... 3. *Corica*.

Dentigerous edge of maxillary extending nearly to præmaxillary; teeth acute, unequal ..... 4. *Clupeichthys*.

## II. A series of keeled scutes from occiput to dorsal fin.

Teeth small; supramaxillary (supplemental bone)

narrow ..... 5. *Potamalosa*.

No distinct teeth; supramaxillary broad ... 6. *Hyperlophus*.



1. KOWALA, Cuv. & Val., 1847  
(type *Kowala thoracata*, Cuv. & Val.).

Near *Harengula*, but with a single broad supramaxillary (supplemental bone) and with a silvery lateral band. Abdominal serrature begins at isthmus. Scales with complete transverse grooves.

A single species.

I am indebted to Dr. Pellegrin for comparing the types of *Kowala thoracata* and *Meletta lile*, and for the information that they are the same species.

*Kowala thoracata*.

*Kowala thoracata*, Cuv. & Val. xx. p. 363 (1847).

*Meletta lile*, Cuv. & Val. t. c. p. 378.

*Clupea lile*, (Hünth. Cat. Fish. vii. p. 450 (1868).

*Clupeoides lile*, Weber & Beaufort, Fish. Indo-Austral. Arch. ii. p. 57 (1913).

Depth  $2\frac{3}{4}$  to  $3\frac{1}{2}$  in the length, length of head 4 to  $4\frac{1}{2}$ . Diameter of eye 3 to  $3\frac{1}{2}$  in length of head. Maxillary extending to below anterior  $\frac{1}{3}$  of eye. Scales 40/10-11. Scutes 17-19 + 9-12. Dorsal 14-17. Anal 17-22. Pelvics 8-rayed, inserted below or a little in advance of origin of dorsal.

Kurrachee to New Guinea.

Thirty specimens, up to 120 mm. in total length.

Weber and Beaufort (Verhand. Akad. Amsterdam, (2) xvii., 1913) state that in this species the median scales between the head and the dorsal fin are keeled scutes. I find that the median scales are quite thin and that the appearance of a keel is due to the underlying series of supraneural bones, the edges of which reach the dorsal profile.

CLUPEOIDES, Bleek., 1851  
(type *C. borneensis*, Bleek.).

Near *Kowala*, but supramaxillary not so large, abdominal serrature beginning behind thorax, and scales with only one transverse groove, the rest radiating.

Rivers of Borneo and New Guinea.

Four species—*C. borneensis*, Bleek., *C. hypselosoma*, Bleek., *C. venulosus*, Weber and Beaufort, and *C. papuensis*, Ramsay and Ogilby (cf. Weber and Beaufort, Fish. Indo-Austral. Arch. ii. p. 57).

3. *CORICA*, Ham.-Buch., 1822  
(type *C. soborna*, Ham.-Buch.).

Anal fin followed by two finlets. Mouth rather small, formed as in *Clupeoides*; teeth minute.

A single species.

I have compared Bleeker's type of *C. pseudopterus* from Borneo with specimens from Orissa (*C. soborna*).

4. *CLUPEICHTHYS*, Bleek., 1855  
(type *C. goniognathus*, Bleek.).

Differs from *Corica* in the structure of the upper jaw and in the stronger teeth.

A single species—*C. goniognathus*—from rivers of Sumatra and Borneo.

Weber and Beaufort (Fishes Indo-Austral. Arch. ii. p. 55) give a figure to show the structure of the mouth; this depicts two supplemental maxillary bones, but on examination of the type I find only one, the supposed anterior bone being part of the maxillary.

5. *POTAMALOSA*, Ogilby, 1896.

Proc. Linn. Soc. N.S.Wales, xxi. p. 504, and xxii. p. 70.

General characters of *Clupea*, but a median series of scutes from head to dorsal fin. Teeth small, uniserial in præmaxillaries and lower jaw; a series of minute teeth on palatines and a strip on tongue. A single narrow supramaxillary. 8 branchiostegals.

A single species from rivers of New South Wales.

*Potamalosia richmondia*.

*Clupea novæ-hollandiæ* (non Cuv. & Val.), Günth. Cat. Fish. vii. p. 431.  
? *Clupea richmondia*, Macleay, Proc. Linn. Soc. N.S.Wales, iv. 1880, p. 380.

Depth of body  $3\frac{1}{2}$  to 5 in length, length of head  $3\frac{1}{2}$  to 5. Diameter of eye 3 to  $3\frac{1}{2}$  in length of head. Jaws equal; maxillary extending to below anterior  $\frac{1}{4}$  of eye. 25 gill-rakers on lower part of anterior arch. Dorsal 16–17. Anal 16–17. Pelvies 8-rayed, below origin or anterior part of dorsal. Scales 46/10–11. Scutes 13+14–15. Vertebrae 46 or 47. A silvery stripe in the young.

15 specimens, 90 to 220 mm. in total length.

6. *HYPERLOPHUS*, Ogilby, 1892.

Rec. Austral. Mus. ii. p. 26.

*Omochetus*, Ogilby, Proc. Linn. Soc. N.S. Wales, xxii. 1897, p. 72.

Like *Potamalosa*, but no distinct teeth, supramaxillary broad, and only 4 branchiostegals.

A single species from New South Wales.

*Hyperlophus spratellides*.

? *Meletta nova-hollandiae*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 376.

? *Clupea vittata*, Casteln. (Maclean, Proc. Linn. Soc. N.S. Wales, iv. 1880, p. 379).

*Hyperlophus spratellides*, Ogilby, Rec. Austral. Mus. x. 1892, p. 26.

*Hyperlophus copii*, Ogilby, Proc. Linn. Soc. N.S. Wales, xxii. 1897, p. 72.

Depth  $4\frac{1}{2}$  to 5 in length, length of head  $4\frac{1}{4}$  to  $4\frac{1}{2}$ . Diameter of eye  $3\frac{1}{2}$  in length of head. Maxillary extending to below anterior edge or anterior  $\frac{1}{4}$  of eye. About 28 gill-rakers on lower part of anterior arch. Dorsal 15–17. Anal 18–21. Pelvics 7-rayed, a little in advance of dorsal. Scales 46–48/11–12. Ventral scutes 19–21+12–14. Vertebrae 47. A silvery lateral band.

9 specimens, 80 to 100 mm. long, including examples received from Mr. Ogilby as *H. spratellides* and *H. copii*. Dr. Pellegrin has kindly examined the type of *M. nova-hollandiae*, 118 mm. long. It is in bad condition, the scales are lost, no dorsal series of scutes can be seen, no teeth are apparent; the anal fin has 22 rays.

LXII.—*Notes on Asteroidea*.—III. By W. K. FISHER,  
Director, Hopkins Marine Station, California.

*LYASTROSOMA*, a new Genus of Asteriidae.—Most nearly related to *Pycnopodia*, Stimpson, but differing in having disconnected marginal plates, with secondary intermediate marginal ossicles; broad mouth-plates and enlarged postoral adambulacral plates; more conspicuous marginal circumspinal sheaths, the inferomarginals being common to 2 spines; adambulacral plates not sunken below level of inferomarginal; rays 5, instead of upward of 24. The rays are soft and weak; abactinal skeleton reduced to isolated, small, spiniferous plates, sometimes interspersed with vestigial perforated

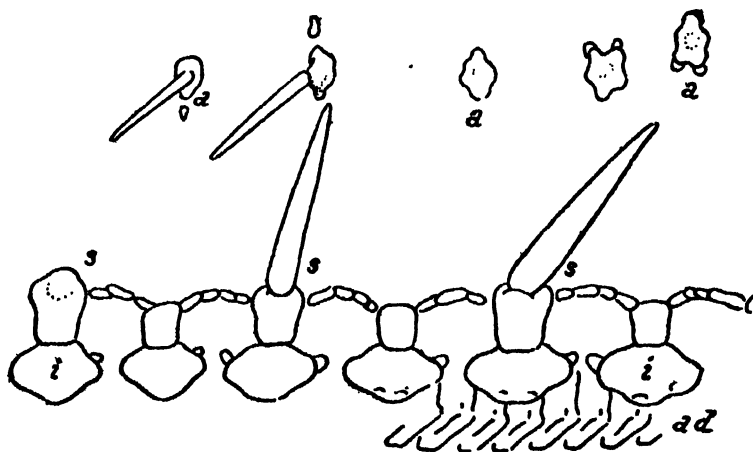
spineless platelets; marginal skeleton weak; superomarginals well separated, connected by a chain or festoon of small secondary ossicles; alternate superomarginals reduced in size and spineless; inferomarginals diplacanthid, spaced, sometimes connected by 1 or 2 secondary small ossicles; abactinal spines well spaced, and, like the marginal spines, surrounded by a conspicuous, tough, retractile sheath expanded distally (and bearing numerous small crossed pedicellariæ), that of the inferomarginals common to 2 spines; adambulacral plates monacanthid, the spinelets without pedicellariæ; mouth-plates broad, with 1 pair of enlarged postoral adambulacral plates in contact on the interradian line; crossed pedicellariæ with a conspicuously enlarged tooth on one side of the end of the jaw, 2 or 3 smaller teeth on the opposite side, and very numerous small teeth on the shank. Straight pedicellariæ small, lanceolate.

Type, the following species:—

*Lysastrosoma anthostieta*, sp. n. (Figs. 1 & 2.)

Rays 5.  $R=63$  mm.,  $r=9$  mm.,  $R=7r$ ; breadth of ray at base 8 to 10 mm. Disk small; rays marked off from

Fig. 1.

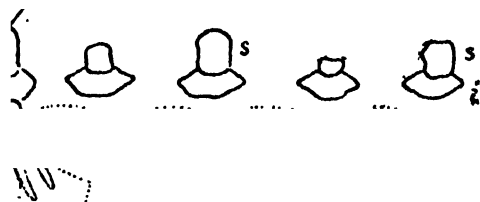


*Lysastrosoma anthostieta*,  $\times 10$ . Marginal and five abactinal plates, from proximal half of ray; base of ray to the right.

*a, a, a*, abactinals; *s, s, s*, spiniferous superomarginals; *i, i*, inferomarginals; *ad*, adambulacral; secondary marginals shown between the superomarginals.

disk by a slight constriction at base; abactinal surface more or less swollen; entire body very soft and flexible; axils rounded; abactinal surface with numerous, widely spaced, small, acicular spinelets, mostly hidden by obconical tough sheaths bearing numerous crossed pedicellariæ on the distal expanded end; each *alternate* superomarginal plate with a similar but much larger spine (3 mm.); each inferomarginal with 2 somewhat flattened, blunt or truncate, stout spines (subequal to the superomarginals); one pair of enlarged adambulacral plates meeting behind the oral plates, their median suture shorter than that of oral plates; the intermediate superomarginal ossicles very weak, lacking on outer part of the ray; submicroscopic perforated plates numerous

Fig. 2.



*Lysastrosoma anthosticta*,  $\times 10$ . Marginal plates from near tip of ray; base of ray toward left; showing absence of connectives.

s, s, s, spiniferous superomarginals; i, i, inferomarginals.

in abactinal integument; tube-feet large, crowded in four rows; furrows broad.

Mororan, Hokkaido, Japan. Collected by D. S. Jordan and J. O. Snyder, 1899.

Type will be deposited in U.S. National Museum; a co-type will be deposited in the British Museum (Natural History).

*Anasterias*, Perrier.—Kœhler, in his recent splendid report on the Asteroidea of the Australian Antarctic Expedition\*, gives considerable attention to this group, to which he adds

\* 'Australian Antarctic Expedition, 1911-14, Echinodermata Asteroidea' (Series C, vol. viii. part 1, Nov. 1920).

two new forms—*A. victoriæ* and *A. adelie*. He recognizes *Pædasterias*, Verrill (type, *Anasterias chiophora*), and describes a new species—*P. joffrei*.

In this revised *Anasterias* he enumerates eight species:—*adelie*, Kœhler; *victoriæ*, Kœhler; *belgicæ*, Ludwig; *cupulifera*, Kœhler; *lactea*, Ludwig; *octoradiata*, Kœhler; *perrieri*, Studer. The type of *Anasterias*—*A. minuta*, Perrier—is omitted. Kœhler examined the types of *minuta*, and says:—"J'ai pu constater que toutes étaient parfaitement identiques à de jeunes *Sporasterias antarctica*. J'estime donc que l'*A. minuta*, forme jeune d'une *Sporasterias* ou peut-être d'une autre *Anasterias*, ne doit pas figurer parmi les espèces du genre *Anasterias*" (l. c. p. 12). Is this not a bit naïve? Obviously, if the type of a genus is out of countenance with all the other alleged species of the group, the rest of the genus takes another name. This was exactly my reasoning in 1908\*, when I renamed Ludwig's and Kœhler's (but not Perrier's) *Anasterias*, *Lysasterias*, with *A. perrieri*, Studer, as type.

If *A. minuta* is "parfaitement identiques à de jeunes *Sporasterius antarctica*," it is not likely to be the young of another *Anasterias*. Since there is some doubt, however, it seems ill-advised to discard *Sporasterias*, a name of later application for that species. There is no excuse, however, for retaining *Anasterias* as the name of the genus of which "*Anasterias*" *perrieri*, Studer, is the oldest described species.

Verrill† states:—"Since the specific name, *Asterias perrieri* Studer, 1884, was preoccupied by *A. perrieri* Smith, 1876, it requires a new name," and he christens it *Anasterias lysasteria*. This was quite unnecessary, as Studer never described an "*Asterias perrieri*." He records *Asterias perrieri* from Kerguelen (Abhand. d. k. Akad. d. Wiss. 1884 (1885), Abth. ii. p. 6). He describes *Anasterias perrieri* in "Die Seesterne Sud-Georgiens" (Jahrb. d. wiss. Anstalten zu Hamburg, ii. 1885, p. 153), both references having been recently verified by Mr. A. H. Clark. *Anasterias perrieri* is therefore the first combination.

*Pædasterias*, Verrill (loc. cit. p. 385).—Type, *Anasterias chiophora*, Ludwig ('Seesterne Expedition Antarctique Belge,' 1903, p. 43). Verrill states:—"Its skeleton is more

\* Smithsonian Miscell. Coll. vol. lli. p. 87.

† 'Monograph of the Shallow-water Starfishes etc.,' Smithsonian Inst., Harriman Alaska Series, vol. xiv. 1914, p. 354.

reduced than in *Anasterias*, the upper marginal plates being absent, except as rudiments distally. It is covered by a thick dermis and bears large, wide, felipedal pedicellariæ." Köhler (*loc. cit.* p. 16) accepts the genus and adds a new species—*P. joffrei*.

Ludwig (*loc. cit.* p. 42) characterizes *Anasterias* as follows:—Five-rayed Asteriidae with monacanthid adambulacrals; antiambulacral arm-skeleton reduced to lateral transverse bars ["Spangen"] and isolated dorsal plates. He divides the species into two principal groups: (a) The bars [which abut on the adambulacrals] are formed of only two skeletal pieces, a reduced supero- and inferomarginal, the latter carrying an inferomarginal spine—*A. chirophora*, *A. lactea*, *A. perrieri*. (b) The lateral bars are composed of more than two pieces—*A. belgica*, *A. studeri*.

In his description of *chirophora*, Ludwig states that the lateral skeleton is composed of these cross-bars, each with two small plates (*loc. cit.* p. 48, fig. 1, p. 49, fig. 2). The plate adjacent to the adambulacrals has its longer axis lengthwise of the ray, and represents the inferomarginal, while the outer of the two has its long axis transversely oriented and represents the superomarginal plate. Moreover, this arrangement of plates in longer or shorter cross-bars is characteristic of the other species of the group known as *Anasterias* (= *Lysasterias*).

Köhler finds in his *Pædasterias joffrei* (*loc. cit.* p. 32) cross-bars of several pieces, as in *Anasterias belgica*, Ludwig (*loc. cit.* pl. vi. fig. 62), but thinks that the superomarginals are not to be found in these arcs. Rather, they are one or two plates, in the interbranchial angle, above the first inferomarginals, and quite independent of the little cross-tiers. The superomarginals would therefore be lacking in the ray.

In *Anasterias tenera*, Köhler, in which the marginals are more strongly developed than in other species (although the abactinal skeleton is normally reduced), these lateral cross-bars are characteristic. In the specimen which I have examined (no. 1842, Museum of Comparative Zoology) these arcs consist usually of two, sometimes of three plates, but the outer, usually spiniferous, superomarginal is oriented transversely, and the inner, inferomarginal, more longitudinally, as in *chirophora*, *lactea*, and *perrieri*.

Köhler may be correct in his interpretation of the lateral plates of *joffrei* and *belgica*, but I think Ludwig is correct in considering as superomarginal the outer of the two lateral plates of *chirophora*, *lactea*, and *perrieri*.

Now if the genus *Pædasterias* is to rest on the structure of the *marginals*, it must obviously include *perrieri* and *lacteu*. The presence in *belgicae* and *studeri* of several plates (instead of only two) in each lateral bar appears to represent simply a slightly less degenerate condition of the abactinal skeleton. In *tenera* one or two small plates are sporadically present above the relatively large superomarginal. These small plates are homologous to the additional lateral plates of *belgicae*. It follows, therefore, that there is nothing characteristic about the marginal plates of *chirophora*, which are practically identical with those of the earlier *Lysasterias*, Fisher (type, *A. perrieri*).

If *Pædasterias* is to be maintained as a genus, it must be on the strength of the large spatulate, unguiculate, straight pedicellariæ. But in *P. jeffreii*, which has the unguiculate pedicellariæ in a less developed form, the lateral arcs are not those of *chirophora*, the type, but of *belgicae*, in Ludwig's second group. If the pedicellariæ are an index of relationship, then the details of the lateral arcs are unimportant, possibly not constant within a species.

The genus *Pædasterias* appears to have been founded upon a misconception. Ludwig (*loc. cit.* p. 42) says of *chirophora*:—"Die Spangen haben (mit Ausnahme der Armspitze) keine oberen Randstachel; grosse Tutzon pedicellarien vorhanden." Verrill (*loc. cit.*) diagnoses the genus:—"... The upper marginal plates being absent, except as rudiments distally." Ludwig states that the upper marginal plates are present. Verrill's "upper marginal plates" is a lapsus for *oberen Randstachel*.

Until the species of *Lysasterias* are better known, *Pædasterias* can well be dispensed with.

*Anasterias octoradiata*, Koehler\*.—This curious eight-rayed sea-star has been well described and figured by Dr. R. Koehler. It differs in several particulars from typical *Anasterias* (i. e., *Lysasterias*). I have examined the type and only specimen, which is now in the U.S. National Museum (no. 38200). It has a *complete* irregularly reticulate abactinal skeleton, consisting of very numerous, small, but fairly robust, oval, elliptical-oblong, and a few irregularly three-lobed plates (which latter perhaps represent the primary dorso-laterals). There is an irregular carinal series, of which the plates are no larger than the others. The abactinal

\* 'Science Bulletin, Museum of the Brooklyn Institute of Arts and Sciences,' vol. ii. no. 4, p. 64, pl. xiv. figs. 1-7: South Georgia.



plates are joined to the superomarginals by transverse bands of plates which are a little more regular than the others, and between consecutive trabeculæ are broad (but short) papular areas, which form a zone just above the superomarginal plates. These papular areas, or skeletal meshes, are larger than the other abactinal and the intermarginal meshes. The marginal plates are fairly robust and of the form usually found in the *Asteriinae*—namely, four-lobed. The descending lobe of the superomarginal is the longest, and strongly overlaps the ascending lobe of the inferomarginal. The superomarginals are regularly monacanthid, while most of the inferomarginals are diplacanthid. There is a very inconspicuous series of small spineless actinal plates.

The skeleton is as well developed as in some specimens of *Sporasterias antarctica* which I have examined.

The gonads are not present in all rays, and are attached to the body-wall on a level with the superomarginals; but the duct turns downward, and I believe that I have demonstrated its external opening on the ventral surface, on a papilla, close to the interradiial line.

I propose to separate this species from *Lysasterias* under the generic title of *Kœhleraster*, in honour of Dr. René Kœhler, of Lyons, well known for his numerous admirable papers on Antarctic echinoderms.

*Kœhleraster* differs from *Lysasterias* in having an open but perfectly normal, irregularly reticulate, abactinal skeleton and well-developed marginal skeleton. It differs from the species of *Sporasterias* in possessing a thick, highly pustulated, "cauliflower" skin.

*Parastichaster*, Kœhler ('*Asteroidea*, Australian Antarctic Expedition,' p. 89).—Type, *P. mawsoni*, Kœhler, first species. In addition to the six-rayed type, Dr. Kœhler describes two other species—*directus*, having 5 rays, and *sphærolatus*, with 6 or 8 rays. These are stout-rayed monacanthid sea-stars, having a rather irregular dorso-lateral skeleton, small carinals, and relatively much smaller superomarginals than in *Stichaster*, to which Kœhler compares the new group. The gonads open ventrally and the young are carried in a cluster over the mouth. The stubby inferomarginal spines are arranged in short, oblique, transverse series.

All these features are characteristic of *Sporasterias spirabilis* (Bell) and adult *S. rugispina* (Stimpson). In fact, *Parastichaster mawsoni* suggests a six-rayed *Sporasterias spirabilis*. The paedophoric habit and monacanthid adambu-

lacrals are outstanding common characters of *Sporasterias* and *Parastichaster*, and the genera are probably identical.

This agreement between a genus which Köhler considers one of the Stichasterinæ and a group that I place in the Asterinæ illustrates how impossible it is in practice to delimit the Stichasterinæ. The Stichasteridæ seemed to be a recognizable group when Perrier and Sladen were working, but it now consists of a series of superficially similar but sometimes quite distantly related forms. Occasionally even the similarity is slight. *Tarsaster*, for instance, is closely related to *Pedicellaster*.

*Stichorella*, Köhler (*loc. cit.* p. 89).—Type, *Stichaster suteri*, de Loriol. I have examined a specimen of this species from New Zealand (no. 18549, U.S. National Museum). It had been dried, but, by soaking in water, the body-wall became flexible, and the gonads, although shrunken, clearly appear to open ventrally, and the eggs are few and large, as in other pædophoric species. Köhler (*loc. cit.* p. 88) states that he does not believe *Stichaster suteri* to be a pædophoric form, but from the context I assume that no specimens were dissected.

I have also dissected a specimen of *Stichaster suteri*, var. *lavigatus*, Hutton (Auckland Islands, N.Z.), and I find that the gonads have large eggs and open ventrally. So also *Calvasterias asterinoides*, which I have examined, has similar gonads, opening ventrally.

In general appearance, and in the form and arrangement of plates, *S. suteri* is closely similar to *C. asterinoides*, but has numerous abactinal granules (Köhler, *loc. cit.* pl. xxi. figs. 1-5). *C. asterinoides* has a more evident dermis and a few carinal spinelets proximally. The Auckland Islands form, which is more closely related to *asterinoides* than to *suteri*, has a carinal series of short spinelets and a few scattered dorso-lateral spinelets. I think *Stichorella* is a synonym of *Calvasterias*.

*Calvasterias* consists of small, monacanthid, broad-rayed Asteroidea having ventrally opening gonads, a rather sharp ventro-lateral margin to ray marked by oblique combs of two to four short inferomarginal spines; superomarginals very broad (the largest plates of all), with one or two granuliform spinelets; dorso-lateral plates usually three-lobed in one or two subregular series; a definite series of strongly imbricated four-lobed carinals; abactinal surface with only a few granules, or with numerous granules, in longitudinal series; an inconspicuous series of actinal plates.

*Cœlasterias*, Verrill\*.—Type, *C. australis*, Verrill. Dr. Köhler (*loc. cit.* p. 91) found great difficulty in obtaining information concerning this genus for purposes of comparison. I have studied a specimen of *C. australis*, the only known species, from Christchurch, New Zealand. The structure of the ray is so similar to that of *Stichaster striatus*, Müller & Troschel [*aurantiacus*, Meyen, nec Linnæus], that *Cœlasterias* might be described as an eleven-rayed *Stichaster striatus*. There are the same broad carinals and superomarginals with transverse series of granules; the same small inferomarginals on the actinolateral border, with much coarser granuliform spines or tubercles in oblique series (frequently two to a plate); the same series of actinal spines that sometimes appear to be part of the inferomarginal armature. The adambulacral armature is diplacanthid or irregularly diplacanthid and monacanthid. In the specimens of *striatus* which I have the armature is diplacanthid and triplacanthid, and only rarely monacanthid. On account of the number of rays, the oral angles are narrower than in *striatus*, and the adoral carina is much longer. The interbranchial septum is stoutly calcified.

In the absence of any differential structural characters, I think that *Cœlasterias australis* should be regarded as an eleven-rayed species of *Stichaster*, typical in all respects.

*Summary*.—Two new genera of Asteriidae are characterized—*Lysastrosoma*, type *L. anthosticta*, sp. n., from Mororan, Hokkaido, Japan; *Köhleraster*, type *Anasterias octoradiata*, Köhler, from South Georgia. Evidence is submitted for considering *Lysasterias*, Fisher, the correct name for *Anasterias*, auct., nec Perrier, and for regarding *Pædasterias*, Verrill, a synonym of *Lysasterias*, *Parastichaster*, Köhler, a synonym of *Sporasterias*, Perrier, *Stichotella*, Köhler, a synonym of *Calvasterias*, Perrier, and *Cœlasterias*, Verrill, a synonym of *Stichaster*, Müller & Troschel. *Anasterias lysasteria*, Verrill, for *Anasterias perrieri*, Studer, is shown to be superfluous.

Pacific Grove, California.

\* Trans. Conn. Acad. Sci. 1869, vol. i. part 2, p. 247.

LXIII.—On the Genus *Notykus* (Mich.), and on a new Species of that Genus. By FRANK E. BEDDARD, M.A., D.Sc., F.R.S.

I RECEIVED lately through the kindness of Mr. Loveridge some species of earthworms collected by him in the Tanganyika district of Eastern Tropical Africa, which were forwarded to me at the Natural History Museum. I have to thank Dr. Baylis for forwarding them on to me at the Zoological Society. Of these worms there were altogether four specimens, of which I left one entirely out of consideration owing to its very softened condition. Of the others one was in a very fair state of preservation for anatomical study, the other two not so good, but still they could be satisfactorily studied. I refer to these three specimens as A, B, and C. They are thus lettered in the collection of the Natural History Museum, to which I have returned them for reference by others. Specimens A and B were collected on a footpath at Chanzuru, near to Kilossa; specimen C at Kilossa. They all seem to belong to one species, in spite of certain apparent external differences, to which I shall refer in the following description. For reasons which will be also apparent in that description, I regard these Eudrilids as a new species of *Notykus*, which I name *Notykus kilossensis*.

The genus *Notykus* has been described by Michaelsen, and not, as it would appear, examined by any other zoologist subsequently to his two papers\*. The characters of the genus and of the single species referable thereto are summed up in the same naturalist's comprehensive work upon the Oligochaeta†.

It is not, of course, unnoticed by myself‡.

Specimen A is about 90 mm. long, with a diameter of 4–5 mm. The second specimen is apparently of much the same size, but has lost hind end, and both, therefore, are quite approximate to *Notykus emini*. Michaelsen, however, states that the setæ of his species are delicate and not large. This is not the case with my species, of which all specimens

\* "Beschreibung der von Herrn Dr. Fr. Stuhlmann auf Sansibar und dem gegenüberliegenden Festlande gesammelten Terricolen," JB. Hamb. wiss. Anst. ix., Hamburg, 1891; "Neue und wenig bekannte afrikanische Terricolen," JB. Hamb. wiss. Anst. Beiheft 2, xiv., Hamb. 1897.

† "Oligochaeta," in 'Das Tierreich,' Berlin, 1900, p. 396.

‡ 'A Monograph of the Order of Oligochaeta,' Oxford, 1895, p. 594 *et passim*.

show certainly very small setæ anteriorly, but much larger ones and stiffly projecting posteriorly and, indeed, for the greater part of the body. This may be claimed, as I think, as a distinct mark of specific distinctness of the two species. So also is the presence of dorsal pores—a rare occurrence, as is known, in Eudrilids. In his earlier paper Michaelsen remarks that these pores were not seen; but does not allude to them in his later memoir upon *Notykus*. They are quite distinct in my species, but only after the clitellum, and are plainer perhaps in specimen A than in specimens B and C.

In agreement with the characters of *N. emini*, my species has a *prostomium* which is extended for a short distance on to the first segment.

The clitellum was developed only in A and C; as I judge from an internal inspection it occupies segments 15, 16, and is developed completely all round the body. These facts are as in *N. emini*.

The *spermathecal pore* and associated pores are on segment 13 (and perhaps 14, see later), and the first examination of the worms from external characters only would perhaps lead to the separation of them into two species. In A—and specimen C hardly differs—the aperture is elongated from right to left, and measures about 1.5 mm. in length; its margins are rather tumid and furrowed at right angles to the long axis of the actual aperture. The aperture when viewed carefully shows that it is divided internally into two pores with a flat dividing area. But these lie within the single area and are thus sunk below the surface of the body. In specimen B, however, the whole arrangement of the various orifices is so different that it is, at first, difficult to refer the two worms to the same species. I believe, however, that they are thus united, for reasons which will appear presently. Here (in specimen B, which, it is to be remembered, is less mature, having no clitellum and also with the internal organs of sex less developed) there is a conspicuous crescentic spermathecal pore with quite unswollen lips, and with the convexity of the crescent directed forwards; behind this are two large orifices nearly meeting in the middle line, with the actual lumen blocked by folds of membrane suggestive of a prolapsus. The three apertures lie in an area which is about 3 mm. across and is furrowed, the lines running longitudinally.

It is clear on *a priori* grounds that the retraction of the two large pores of specimen B would produce a state of affairs such as is to be noted in specimens A and C.

This matter will be considered further in relation to the various organs which are connected with the three orifices just described.

The *male pore* of this species is on segment 17 and also in the middle line of the ventral surface. In specimen A it is very small and measures about .5 mm., and is surrounded by radiately arranged folds of the skin. In B the equivalent aperture is much larger, and measures 2 mm. from side to side. Moreover, in this particular worm the front margin of the longitudinal orifice has two cushion-like projections and the posterior margin one such projection. Here, again, the differences in size etc. might be explained by a contraction of the body pulling in the external aperture. It will be noted anyhow that the two apertures, male and female, of each of the two specimens correspond in this particular—i. e., both are retracted in the one and both expanded outwards in the other specimen.

The external characters are to my mind alone quite sufficient to distinguish the present species from *Notykus emini*. The larger setæ and dorsal pores of the former contrast with the converse state of affairs shown in *N. emini*. Moreover, Michaelsen speaks of the orifices on either side of the spermathecal pore as "kleine spaltförmige Oeffnung," and as "etwas nach vorn gerückt . . . schlitzförmigen Oeffnungen," which does not tally with the wide circular orifices in my specimen, which lie distinctly behind the spermathecal crescent-shaped opening. That they belong, however, to the same genus is clearly shown by the peculiar penial setæ figured by Michaelsen, which in both my specimens have the end bent at right angles and covered with low spines, presenting, as Michaelsen points out, a resemblance to a file. It hardly seems likely that precisely the same modification of the penial setæ would occur in two genera. The internal characters, moreover, furnish further proof of the generic identity of specimens; but enable me to add something to what is known of the genus *Notykus*, and possibly present further differences between the two species.

In considering the value of these apparent differences, the greater maturity of specimens A and C must be borne in mind. Thus, in these worms the interior of segment 12 was filled with masses of sperm on both sides of the intestine, quite blocking the coelomic cavity of that segment. Of these I found no trace in specimen B, in which, moreover, the sperm-sacs of segment 12 were much less developed. These features are obviously due to different maturity. Furthermore, the male terminal apparatus differed slightly

in the two. In A the masses of muscles forming a hollow sheath for the single penial seta were thicker and more numerous than in the younger individual. In both, however, they reached to the converging ends of the separate prostates, and were thus more conspicuous than in the individual figured by Michaelsen in the first of his two memoirs dealing with this genus. This, again, may be fairly ascribed to greater maturity in specimen A. In these characters, therefore, there are no generic differences from Michaelsen's specimens. I have also identified the peculiar median body thought at first by Michaelsen to be a median single ovary. I have no suggestions to make as to the nature of this body, except, perhaps, that it may correspond to the glandular bodies attached to the end of the spermathecal sac in the genus *Eudriloides*.

One internal character, however, fairly obviously cannot be referred to differing maturity—that is, the conditions of the intersegmental septa as to their relative thickness. I have examined these in all of my examples, with particular success in the case of specimen C, which was divided longitudinally into two halves before further dissection. This enabled an accurate picture of the septa to be seen. In his earlier paper on *Notykus emini*, Michaelsen states that septa 5/6–9/10 are thick septa, but in the later paper that the thickened septa are those lying between 5/6 and 11/12. Of these, he adds, the middle ones are the most thickened. There is an obvious discrepancy here. In his great work upon the Oligochaeta, in which the facts are presumably revised, the thick septa are placed between 6/7 and 10/11, 5/6 and 11/12 being feebly thickened. In the example of *Notykus kilossensis*, which I bisected longitudinally, the first clearly marked septum lay just behind the gizzard, and thus separated segments 5/6. Thereafter four septa, of which the last two were thicker than those in front, separated segments 6/7–9/10. Septum 10/11 was a delicate septum pushed forward by the mass of sperm collected in segment 11, and might easily be missed owing to its lying for the most part in contact with the septum in front. I shall again refer to the septa in dealing with the spermathecal sac; but, in the meantime, I would point out that there would seem to be a specific difference in the arrangement of these so far back as segment 11. It may be also that the first example of *Notykus emini* described by Michaelsen is different from those subsequently examined, and is identical with my species described here.

The organs connected with reproduction, in addition to the

penial setæ described above, also tend to prove generic identity, though differing in detail (particularly the spermathecal sac). There is in the present species clearly but one pair of sperm-duct funnels, which lie in segment 11, and one pair of sperm-sacs, which are in the following segment.

*Spermathecal Sac.*—The general characters of this sac agree with those described by Michaelsen for *Notykus emini*; but there are certain details which require emphasis. I have studied these in all three specimens: in two by dissection from above—by cutting through the body-wall along the dorsal median line; in the third (C) by dividing the head-end of the body longitudinally and examining the sac in a lateral view. The latter allowed of a complete lateral external view, as the whole of the spermathecal sac was left in the right half of the body after the bisection.

In B, the immature example, the sac is divisible into three regions: in the middle of a muscular region presenting quite the appearance of a gizzard, which narrowed abruptly posteriorly to form a narrower tubular soft-walled sac ending behind in a slightly dilated extremity; anteriorly the muscular sac became a soft region rather flattened dorso-ventrally, which bent down at right angles to open on to the exterior by the narrow crescent-shaped external orifice, already described. When cut across, the gizzard-shaped median region was seen to be very thick-walled, and its muscular fibres gave to it a nacreous glitter common to such structures.

Firmly attached to the terminal region of the spermathecal sac and one on each side lay two muscular bodies, spherical to rather more oval in form, which have muscular walls. These are clearly the "Nebentaschen" of Dr. Michaelsen's descriptions. I did not detect in this specimen the delicate sac involving the spermathecal sac which is mentioned by the last-named author. But the egg-sacs were evident one on each side of the anterior end of the muscular part of the spermathecal sac. Some filmy membranes, which I could not map out, are doubtless the remains of the cœlomic chamber referred to by Michaelsen. These I refer to later.

The accessory pouches ("Nebentaschen"), closely attached to the outward end of the spermathecal sac, communicate, as it would appear, with the exterior through the paired orifices, described above as lying behind the spermathecal opening. I cannot recall any structure precisely similar to these among the Oligochæta. They might conceivably be the vestiges of sacs formerly containing copulatory setæ, such as do occur in the group. But this suggestion is



not at variance with the possibility that they are to be looked upon as evidence of the originally paired condition of the spermathecal sac, which is held to be the primitive state of affairs in the Eudrilidæ as in other families. In this case *Notykus* would bear the same relationship among the Pareudriliacea to the forms with paired (e.g., *Pareudrilus*) and unpaired (e.g., *Eudriloides*) orifices, as does the genus *Gardullaria* among the Eudrilacea\*, to corresponding forms in that group.

On this hypothesis, the single median pore of the spermathecal sac would have to be a new formation, the original pores with their muscular ducts being converted to another function. That there is no necessary difficulty in this is shown by the case of *Polytoreutus multiporus*†, in which species that sac does form supplementary external pores.

In the two fully mature individuals the conditions are a little different. When examined from above (specimen A), the muscular part of the spermathecal sac is seen to be mostly covered over by a large muscular flap, one on each side; this presents the appearance of a thickened septum, and, as I point out later, may indeed be its derivative. A closer examination of this sheet of muscle shows that it is in reality a sac—empty, so that its two walls, dorsal and ventral, are in contact, thus giving to it the appearance of an empty coal-sack lying across the rounded mass, which it partly conceals. The two sacs seem to be continued anteriorly into a thin membrane covering the anterior portion of the spermathecal sac. When the two walls were divaricated by pushing a mounted needle between the two walls, the sac was seen to be prolonged downwards towards the ventral median line of the body. To the side of and behind these sacs lay on each side of the body the receptaculum ovarum. The position of this latter thus differs in the more mature individual. This may be produced, of course, by the growth of the flattened muscular sacs intervening.

In the bisected individual (C) the conditions can be further examined, and their relationships to other structures seen from the lateral point of view. Among other things, the exact number of segments occupied by the spermathecal sac can be detected. The anterior muscular part of this organ reaches from the 13th to the end of the 14th segment.

\* Michaelsen, "Die Oligochæten Nordost-Afrikas," Zool. Jahrb. xviii. (1903), p. 498, Taf. xxv. fig. 23; see also *id.*, "Die Oligochæten Deutsch-Ostafrikas," Zeitsch. wiss. Zool. lxxxi. (1905), p. 301, fig.

† Smith and Green, "Descriptions of new African Earthworms &c.," Proc. U.S. Nat. Mus. lv. (1919), p. 163.

The softer narrower region of the sac following this lies for a certain portion of its length in a straight line coextensive with the clitellum—i. e., occupying segments 15, 16. This part is enclosed in a cœlomic sac and ends at septum 16/17, which is in contact with the front wall of the large bursa copulatrix. A further region of the spermathecal sac turns abruptly upwards and lies dorsally. I do not see any difference in structure here, except in the fact that, as already mentioned, it ends in a slight dilatation.

Anteriorly the cœlomic sac, which involves loosely the tubular region of the spermathecal sac, and therefore encloses a considerable hollow space in addition to that sac, appears to be continuous with the muscular sacs already described as lying upon the muscular mid region of the spermathecal sac. It connects them together and to the walls of segment 13; the wall of this part of the cœlomic sac is, however, more closely attached to the surface of the muscular section of the spermathecal sac. There is but a narrow cavity within it. I am disposed to believe—but I cannot absolutely prove the matter—that the peri-spermathecal cœlomic sac is continuous with the sac lying between the two sheets of muscle on each side, which extend over the muscular region of the spermathecal sac in the way that has been described. As in specimen B, already described, the spermathecal sac ends in front in a rather flattened strap-shaped region bending down at right angles, or nearly so, to the median muscular part to approach the median line of the body-wall. An actual external orifice, if present, is hardly visible, and it is quite possible that it is plugged, as is the case for example with species of *Eudriloides*—e. g., *E. cotterilli*, as figured by myself\*.

Neither in "A" nor "C" could I find the crescent-shaped pore so obvious in "B." Furthermore, it is plain from this longitudinal section of the worm that the spermathecal pore is not retracted with the external orifices of the "Nebentaschen." Nor could they very well be retracted, I should imagine, from a consideration of the structure of these parts.

This fact of itself is a difference from the other species of the genus, *Notykus emini*, in which Michaelsen distinctly states that the spermathecal pore itself can be retracted together with the orifices of the "Nebentaschen." This could hardly be possible in the present species, and for the

\* "A Contribution to our Knowledge of the Oligochaeta of Tropical Eastern Africa," Quart. J. Micr. Sci. xxxvi. (n. s.), pl. xvii. fig. 16.

following reasons:—The external orifices of the “Nebentaschen” in the bisected specimen now under consideration are considerably retracted, as I have explained; but the distance between their openings and the line along which the spermathecal pore touches the body-wall, which is very plain, is considerable. For, while the spermathecal pore is clearly upon segment 13, the pores of the muscular appendices are not only in the 14th segment, but some little way within it. A great area would have to be pulled inside the body-cavity if the spermathecal pores were to be withdrawn. Furthermore, the strap-like external region of the spermathecal sac is tightly tied to the slender wall forming the septum 12/13, which together with the spermathecal sac itself forms a closed cavity within which lies the peculiar accessory gland, referred to above, and—as I believe, though I have not clearly seen them—the ovaries and the funnel of the oviduct. All this complex would have to be pulled inwards if the spermathecal pore were retracted, and it does not seem possible. In any case, the spermathecal pore was *not* retracted in this specimen.

The muscular double-walled bands lying across the spermathecal sac, which have been described, lie, it should be added, in an oblique direction from before backwards; it is possible that they represent septum 14/15, which is otherwise not recognisable. Nor, for the matter of that, is the next septum—*i. e.*, 15/16.

In the angle which lies between the muscular gizzard-like region of the spermathecal sac and the anterior downwardly directed external passage of the same lies a triangular-shaped muscular sac, which is clearly the “Nebentasche” of its side. It is not so uniformly rounded as in the less mature example B; but ends above in quite a pointed end. It lies over the gizzard-like region and is marked off by a deep furrow from the strap-shaped end of the spermathecal sac, and by a less marked, but still quite marked, furrow from a muscular layer lying across the gizzard-shaped median region of the spermathecal sac.

The two masses of muscle, thus brought into intimate connection with the spermathecal sac, must presumably, when contracting, tend to compress the sac and to squeeze out its contents. If this sac, as in the allied genus *Stuhlmannia*, contains a spermatophore, this might conceivably be expelled by the contractions. But of such functions we know nothing in these and allied worms.

Nothing at all corresponding to the posterior double sheet

of muscle occurring in *Notykus kilossensis* is mentioned by Michaelsen in *Notykus emini*.

It will be plain from the above account of the spermathecal sac in the two mature examples of my new species, A and C, that there are differences between them which are probably to be put down to greater maturity in the specimen A than in C. The muscular bags lying over the posterior region of the spermathecal sac in A are much thicker than the thin sheet which is described above in the bisected individual C. Their lumen also appears to be continuous with that of the "Nebentaschen," with which, indeed, they seem to be quite continuous structures—a backward extension, that is to say, of the "Nebentaschen." The conditions observable in specimen C may indicate that the actual origin of the "Nebentaschen" and the posterior sacs of the spermathecal sac are distinct. But I have not ascertained whether the undoubtedly more delicate muscular layer of the posterior region of the spermathecal sac in C is actually double, and, therefore, contains a lumen. Intermediate stages appear to me to be wanting—the two do not constitute a chain without a break.

LXIV.—On some new Mammals from Korea and Manchuria.

By Prof. T. MORI, Keijo High School, Seoul, Korea.

IN the course of some studies of Korean and Manchurian mammals, undertaken in the British Museum (Natural History), by the kind permission of Sir Sidney F. Harmer and Mr. Oldfield Thomas, I have found the following hitherto unnamed mammals. The types of these have been presented to the British Museum.

*Nyctereutes koreensis*, sp. n.

*Nyctereutes procyonoides*, Gray, Thomas, P. Z. S. 1907, p. 404.

*Type*.—Adult male (skin and skull). Original number 2. Collected at Giseifu, near Seoul, Korea, January 24th, 1922, by Mr. Eizo Takahashi. B.M. no. 22. 10. 6. 6.

*Diagnosis*.—Size less than that of *Nyctereutes ussuriensis*, Matschie, and *N. amurensis*, Matschie, of the Amur region. Cheek darker, forehead and part under the ear whiter than in

*Skull-measurements of Nyctereutes (in millimetres).*

	<i>viverrinus.</i>		<i>koreensis.</i>				<i>procyonoides.</i>				<i>ussuricus.</i>		<i>amurensis.</i>
	♂. 2.5.30.2. Japan.	86.3.20.2. Japan.	I. Korea.	II. Korea.	III. Korea.	2.6.10.20. China.	2.6.10.21. China.	2.6.10.19. China.	7.7.3.6. China.	7.7.3.7. China.	A. 4987.	4987.	4555. Amur.
Greatest length.....	116	107	115	119	..	110	111	116	114	112	127.8	126.3	..
Greatest breadth .....	65.5	58	64	69	67	62	64	61	62	61.5	71.3	68.5	68.2
Basal length .....	108	103	107	110	..	103	102	..	104	104	118.3	118.3	115.1
Nasal length .....	42	43	40	46	42	42	40	44	43.5	46	48.2	45.1	49.2
Length of naso-frontal suture.....	17.5	17.5	18	21.5	21	15	17	15.5	18.5	17.5	..	..	..
Length of naso-premaxillary suture.....	22	16	22.5	25	21	17	18.5	18	19.5	18.5	..	..	..
Breadth of premaxillae .....	14.5	14	15	16	15.5	14	13.5	14.5	14	15	..	..	..
Breadth of maxillae over the canine .....	19	18	20	22	22	19	20	20	20	19.5	..	..	..
Palatal length .....	57.5	52	53.5	55.5	54	57.5	52.5	..	56	53	61.4	63.4	62.4
Length of upper molar row .....	39	..	37	39.5	38.5	38	36	38	39	39	39.8	40.5	39.7
Length of mandible.....	..	79	87	91	85.5	85.5	84	83	85.5	84	95.5	93.8	90.6
Height of mandible.....	46	39.5	47	49	43.5	44	44	44	43.5	45	50.4	49.7	49.7

the Chinese *N. procyonoides*, Gray, and Japanese *N. viverrinus*, Temminck; and central black stripe conspicuously like the mane.

Skull with zygomatic arch wider and auditory bullæ larger. As distinguishing character, premaxillæ extend backwards to the narrow point of the projecting frontals, thus completely cutting off the maxillæ from the nasals.

*Colour*.—Fur very long, soft, and thick. Head: cheek black, nose tawny olivo, forehead whitish with blackish tip to the hair, and under the ear white with long white hair. Ear rufous with dark brownish margin. From the top of the head over the neck to the shoulder-mane a single continuous black stripe; this stripe extends to the upper part of the body and down the hip. The upper part of the body and the hip rather dark brownish, with black tip and greyish-white base to the long hair (length 90 mm.) and thick buff underfur. The sides of the body covered with dark brown intermixed with greyish-white hair. Chin dark slate, throat and breast of a dirty fawn-colour, with dark brownish tip to the hair. Tail bushy, end and upper part blackish, underpart buff. Foot blackish slate.

*Dimensions* (from dry skin).—Head and body 660 mm.; tail 180.

Skull: greatest length 119; basal length 110; greatest breadth 69; nasal length 46; length of naso-frontal suture 21.5; length of naso-premaxillary suture 25; breadth of premaxillary 16; breadth of maxillæ over the canine 22; breadth of the postorbital process 34.5; frontal length 50; palatal length 55.5; length of upper molar tooth-row 39; mandible length 91; mandible height 49; distance of  $M^2$  to  $P^2$  23.

*Specimens examined*.—Three, all from Korea.

I append (p. 608) my measurements of the skulls of *N. viverrinus*, *N. procyonoides*, and *N. koreensis*, with those of *N. ussuriensis* and *N. amurensis* given by Professor Paul Matschie, who describes them as new\*.

### *Felis manchurica*, sp. n.

*Type*.—Adult male (skin only). Original number 1. Collected near Mukden, the capital of Manchuria, February 14th, 1922, by Munckatsu Nagura. B.M. no. 22. 10. 6. 4.

*Diagnosis*.—This species can be distinguished from *Felis microtis*, A. M.-Edwards, and *Felis euphilura*, Elliot, with

\* Paul Matschie, 'Ueber Chinesische Säugetiere, besonders aus den Sammlungen des Herr Wilhelm Filchner,' pp. 178-180 (1907).

which it is nearest allied, by its having (1) ground-colour whitish grey with whitish underfur, (2) two large dark brown stripes on the shoulder, (3) long, bushy, ringed tail.

*Colour*.—Fur soft, thick, and rather long. Ground-colour of the body whitish grey, covered with dark reddish-brown spots. On the head there are white lines each side of the nose and under the eye; two dark brown stripes in the centre, commencing at the top of the nose and on each side of it, and two more beginning at each eye, passing over the top of the head and down the back of the neck to the shoulders. On the shoulder are situated two large, oblong, blackish-brown patches, and on each side two long reddish-brown stripes; a dark brown stripe from the corner of the eye runs back across the cheek to the base of the ear, and another dark red stripe, starting below the eye, passes across the cheek and curves back under the throat. In addition, a dark brown line beginning behind the ear runs down each side of the neck, and, turning downward, forms the band. The centre of the back is much darker than the sides and marked with many confused dark brown spots. Cheeks, lips, throat, and breast white. The throat and breast crossed by four bands (some of which are broken) of the colour of burnt sienna. The belly is buff covered with chestnut-brown spots. Legs same colour as the body, but the feet and inside of the hind legs buff, with two or three imperfect rings on the fore legs and four or five similar rings on the hind legs. Tail long and bushy, reaching to the ground, with confused markings at the upper part of the base and twelve or thirteen narrow broken rings on the upper part of the remaining portion; tip of the tail black. Nose brown, with short hair. The inside of ear is buff, the back black with a white spot.

*Dimensions* (approximate) from skin.—Head and body 730 mm.; tail 350; hind foot 125; ear 38.

*Charronia flavigula koreana*, subsp. n.

*Type*.—Adult male (skin and skull). Original number 2. Collected at Korio, near Seoul, Korea, December 16th, 1907, by Mr. Eizo Takahashi. B.M. no. 22. 10. 6. 8.

*Diagnosis*.—This subspecies is most nearly allied to the Amurland *Charronia flavigula borvalis*, Radde, but is very much paler in colour of upper part; underpart of the body with whitish underfur. Size smaller, tail shorter, and skull narrower. The white part of the chin extends sideways and reaches to the auditory canal, which is not the case in the Amurland form.

Skull-measurements of *Hydropotes* (in millimetres).

	<i>Hydropotes argyropus</i> .		<i>Hydropotes inermis</i> .				
	♂. Korea. I.	8.11.148. ♂. Shanghai.	8.11.14.10. ♂. Shanghai.	72.9.3.5. ♂. Shanghai.	6.12.5.14. Chinkiang.	7.7.3.32. ♂. N. China.	13.9.13.19. Hwong-ti-tze, Hupeh.
Greatest length .....	171	163	168	163	163	169	160
Basal length .....	149	144.5	148	145	144	156	139
Zygomatic breadth .....	75	71	69.5	72	72.5	70	65
Nasal length .....	59	..	56	49	52	58	54
Infraorbital breadth .....	35	31	33.5	33	32	30	29
Interorbital breadth .....	39	35	35	36	34	35	31
Palatal length .....	..	91	96	90	96	99	94
Length of upper molar row ..	49	47	48	51	50	46	50
Greatest breadth of maxillæ over <i>M</i> <sup>1</sup> .....	54	52	52	53	51	49	47
Length of tusk .....	56	53.5	48	51.5	..	46	48
Distance of base of both tusks	24	25	22	23.5	23.5	23	19
Distance of tip of both tusks	36	94	65	67.5	..	51	26
Length of bullæ .....	19.5	21.5	21	21.5	21	21	22
Distance of tuak to <i>P</i> <sup>1</sup> .....	20	30	28	31	28.5	28	26



*Colour*.—Fur soft, thick, and rather long. The head, sides of face, feet, and tail dark brown. The dark stripes from the ears extend backwards. Upper part of the body buff, with whitish underfur, shading gradually to dark brown on the hind-quarters. The hairs of the nape and upper neck have buff tips with dark-coloured bases. Chin white, in hind part the whiteness extends sideways as far as each auditory canal. The throat light yellow and the rest of the underpart of the body whitish, with white underfur. Soles of the feet hairy.

*Dimensions*.—Head and body 590 mm.; tail 410; hind foot 103; ear 34.

Skull: greatest length 102; basal length 95; zygomatic length 57; least breadth at postorbital constriction 25; length of palate 45; least breadth of palate between caninials 15.

*Specimens examined*.—Two, both from Korea.

### *Hydropotes argyropus*, Heude.

Père Heude, in 'Comptes Rendus des Séances de l'Académie des Sciences,' tom. xcvi. p. 1017 (1884), gives the name of "*Hydropotes argyropus*" for the Korean *Hydropotes*; but his description is very short. Therefore Mr. Lydekker inserted the synonym of *H. inermis*, Swinhoe, in 'Catalogue of Ungulate Mammals,' vol. iv. p. 258 (1915). But I think it a different species, from the following description of a specimen in my school, and I propose to use for it Heude's name "*Hydropotes argyropus*."

*Locality*.—Mokpo, Zenranando, Korea.

*Diagnosis*.—Size of skull larger than that of *H. inermis*, Swinhoe; the tips of the tusks curve slightly inwards, whereas in *H. inermis* the tips of the tusks have a conspicuously outward curve. The distance of tusk to  $P^1$  very short. General colour lighter.

*Colour*.—General colour greyish white, underpart whitish.

*Dimensions*.—Head and body 35 inches; tail 3; hind leg 21.

Skull: greatest length 171 mm.; basal length 149; zygomatic breadth 75; nasal length 59; infraorbital breadth 35; interorbital breadth 39; palatal length —; length of upper molar row 49; length of tusk 56; distance of tusk to  $P^1$  20.

### *Sus coreanus*, Heude.

Père Heude, in his 'Mémoires d'Histoire Naturelle de l'empire Chinois,' tom. iii. 1896, pp. 191-192, gives the name of "*Sus coreanus*" after an examination of three skulls

Skull-measurements of Far East Wild Boar (in millimetres).

	<i>S. coreanus.</i>	<i>S. leucomystax</i> <i>continentalis.</i>	<i>S. leucomystax.</i> Japan.	<i>S. l. taianus.</i> Formosa.	<i>Sus</i> sp.
	I. Korea.	Vladivostok.	80.3.20.29. Japan.	70.2.10.38. Formosa.	70.2.10.38. Shanghai.
Greatest length.....	430	447	330	345	400
Basal length.....	305	393	255	305	345
Zygomatic breadth.....	155	166	130	150	167
Infraorbital breadth.....	44	..	33	37	37
Interorbital breadth.....	85	..	71	80	60
Postorbital breadth.....	112	..	92	108	118
Nasal length.....	225	..	164	170	194
Greatest breadth of nasal cavity.....	57	..	36	36	43
Palatal length.....	255	..	200	220	250
Length of $P^1 + M^3$ .....	235	..	..	195	230
Length of $M^1 + M^2$ .....	46	48.5	40	46	41
Length and breadth of $M^3$ .....	37 x 22	breadth 23	length 19	31 x 20	41 x 22
Rostral depth of between $P^1$ .....	73	..	57	58	68
Length of upper margin of lacrymal.....	66	73	48	51	46
Length of lower margin of lacrymal.....	29	36	24	28	..
Height of anterior margin of lacrymal.....	33	39	32	34	..
Height of posterior margin of lacrymal.....	30	31	22	25	..

of a wild boar from Korea, but that description was in some respects incomplete; therefore mammalogists do not mention it at all. I give here a detailed description from a specimen in my school, and I should use for it the name of "*Sus coreanus*."

*Typical locality*.—Tetsugen, Kogendo, Korea.

*Diagnosis*.—Similar to *Sus leucomystax continentalis*, Nehring, but skull narrower, premolars of each half upper jaw 4 instead of 5, lacrymal pits shallow and unrecognizable, infraorbital foramen narrow and high (breadth 8 mm., height 13), and posterior margin straight. Posterior portion of nasal, together with anterior portion of frontal, conspicuously convex. Nasal cavity broader. Anterior portion of the lower jaw slightly curved upwards.

*Colour*.—General colour brown (not black-brown). The streak from angles of mouth to lower jaw inconspicuous. Underpart brownish. The bristles along median line of neck and shoulder are lengthened and form a crest. Underfur dense and woolly.

*Dimensions*.—Skull: greatest length 430 mm.; basal length 355; zygomatic breadth 85; nasal breadth 225; greatest combined breadth of nasals 38; palatal length 255; length of  $i^1 + M^1$  235; rostral depth between  $P^4$  73; greatest length of  $M^1 + M^2$  46; length and breadth of  $M^3$   $37 \times 22$ ; length of upper margin of lacrymal 66; length of lower margin of lacrymal 29; height of anterior margin of lacrymal 33; height of posterior margin of lacrymal 30.

#### LXV.—On Two Forms of the Korean Hedgehog.

By Prof. T. MORI, Keijo High School, Seoul, Korea.

THE series of five specimens of the Korean hedgehog shows that this strikingly characterized animal is represented by two readily distinguishable forms, which may be briefly defined as follows:—

#### *Erinaceus dealbatus orientalis*, Allen.

*Erinaceus orientalis*, Allen, Bull. Amer. Mus. Nat. Hist. vol. xix. pp. 179-181 (1903).

♀, Korea: original number II. ♂, Korea: original number V. From near Kanko, Korea.

A pale brown species allied to *Erinaceus dealbatus*, Swinhoe, by having wholly white spines intermixed with the pale

Skull-measurements of Far-East Hedgehog (in millimetres).

	<i>Erinaceus dealbatus</i> .			<i>E. dealbatus orientalis</i> .			<i>E. amurensis koreensis</i> .		
	N. China. ♀. 8.2.8.2.	N. China. 61.6.2.5. Type.	N. China. N. China. ♂. 8.2.8.1.	Vladivo- stok (Allen).	♀. Korea. II.	Korea. V.	Korea. I.	Korea. III.	Korea. IV.
Greatest length .....	53	..	..	61	..	56.5	50	..	..
Basal length .....	51	..	..	..	..	54	47	..	..
Zygomatic breadth .....	33	29	..	39	34	34.5	31	29.5	28
Palatal length .....	31	..	30.5	..	30.5	33	28	27	28
Nasal length .....	15.5	..	16.5	19	15.5	20	15	13.5	16
Length of naso-premaxillary suture .....	6	..	8	..	7	8.5	8	5	7
Length of naso-maxillary suture .....	5.5	..	4	..	3	3	2.5	3.5	3.5
Length of naso-frontal suture .....	4	5.5	4.5	..	5.5	9	5	4	5
Infraorbital breadth .....	18	17.5	18.5	..	18	18.5	17	16.5	16
Interorbital breadth .....	18.7	13	13	..	12	13.5	13	12	13
Breadth of brain-case .....	22	21	..	..	22	24	21	21	19.5
Length of maxillo-premaxillary suture ..	11	10	11	..	11	12.5	12	10	10
Length of upper molar row .....	18	17.5	18	..	17	20	17	17	17
Length of $i^1 + M^3$ .....	28.5	..	28	30	27	30	25.5	25	24
Length of lower molar row .....	16	17.5	17	..	16	16	16	16	16
Length of $i^1 + M^3$ .....	24	22.5	23	..	22.5	24	21	21	21

brown ringed ones, but size larger; molar teeth, especially  $M^1$  and  $M^2$ , smaller. Muzzle darker and longer.

*Erinaceus amurensis koreensis*, subsp. n.

*Type*.—Adult male (skin and skull). Original number I. Collected at Kaijo, north of Seoul, Korea. B.M. no. 22.10.6.1.

*Diagnosis*.—A dark brown species allied to *Erinaceus amurensis*, Schrenck, but size smaller and head much darker.

*Colour*.—Wholly white spines intermixed with dark brown ringed ones; the spiny dorsal area is brownish, as in *Erinaceus europæus*, L. Head blackish brown; shoulder, sides, limbs, and tail brown. Underpart pale brown, feet dark brown. Ears small, dusky brown.

*Dimensions*.—Head and body 21 mm.; hind foot 38; ear 20.

Skull: greatest length 50; basal length 47; zygomatic breadth 31; palatal length 28; nasal length 15; interorbital breadth 13; length of upper molar row 17; front of  $\hat{a}$  to back of  $M^3$  25.5.

LXVI.—*A new Bat of the Genus Miniopterus from N. Australia.* By OLDFIELD THOMAS.

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THE British Museum has received from Mrs. Edward Wilson some small mammals collected by her near Port Darwin, Northern Territory of Australia. Among these there are three examples of a *Miniopterus* so much paler in colour than any other member of the genus that they would appear to represent a new form, which, in honour of its collector, may be called

*Miniopterus orianæ*, sp. n.

General characters as in the larger species referred to *M. schreibersi*. Colour nearly uniform pale brown (near, but not quite as dark as, "sayal-brown"). Under surface cinnamon, the inguinal region a little paler. Head faintly greyer than back.

Skull large, well inflated, agreeing closely with Queensland specimens referred to *M. schreibersi*. Much larger than in *M. australis*.

Dimensions of the type:—

Forearm 44 mm.

Head and body 57; tail 47; third finger, metacarpus 40, first phalanx 10, second phalanx 34.

Skull : greatest length 15·2 ; breadth of brain-case 8·2.

*Hab.* Port Darwin, North Australia. Type from Casuarina Bay ; sea-level.

*Type.* Adult male. B.M. no. 22.10.8.1. Original number 5. Collected 9th July, 1922, and presented by Mrs. Oriana F. Wilson. Three specimens.

The remarkably pale brown colour of this *Miniopterus* distinguishes it from any other member of the genus, for other pale species are of quite a different and more greyish kind of pallor.

LXVII.—*New Species of Neuroptera in the British Museum.*

By P. ESBEN-PETERSEN, Silkeborg, Denmark.

By the kindness of Mr. Herbert Campion I have had the pleasure of looking over some Neuroptera belonging to the British Museum. Amongst the material three new and undescribed species were found—viz., *Disparomitus rufocostatus* (Ascalaphidæ), *Palpares pulchellus*, and *Palpares auratus* (Myrmeleonidæ).

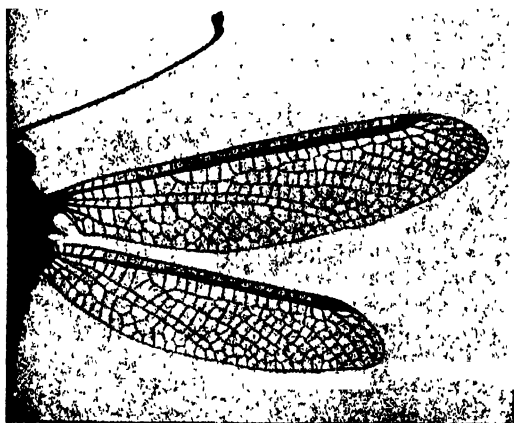
*Disparomitus rufocostatus*, sp. n.

Clypeus, labrum, and palpi reddish brown ; face blackish shining. Vertex and face with very long blackish and greyish hairs. Antennæ two-thirds the length of anterior wing, sanguineous, yellowish annulated ; club broad, blackish, somewhat paler internally. Thorax pale chocolate-brown, with black streaks and spots ; dorsum of mesothorax with a figure somewhat like that on the death's-head moth ; hairs rather long, black. Underside of thorax pale chocolate-brown, with black and grey hairs. Legs rather short and stout, reddish brown, with long black and grey hairs ; knees and tarsi black ; tarsi a little longer than tibiæ ; spurs hardly as long as first tarsal joint. Abdomen very long, much longer than fore wing, rather slender, blackish ; first and second segments partly brown ; basal part of abdomen with a few long and black hairs, the rest of abdomen with shorter black hairs. Dorsum of first abdominal segment with a saddle-shaped elevation. Appendages of male very short, their tip laterally directed. Wings equally broad in their apical two-third parts ; tip obtusely rounded ; posterior angle of the fore wings rather prominent. Cross-veins of wings black ; longitudinal veins with the exception of *Rs* and all the branches from *Rs* and *Cu*<sub>1</sub> reddish. *R* blackish from pterostigma to tip of wing. Pterostigma yellowish brown, conspicuous, twice as long in hind wing as in fore wing ; in

anterior wing it encloses three cells, in posterior wing four or five cells. Membrane of wings hyaline; in subcostal area reddish (almost sanguineous). The base of wings blackish, with a yellowish spot at the base of the fore wing. In the apical area of fore wing three rows of cells, in that of hind wing two rows. *Rs* emits six branches in both pairs of wings. In fore wing six or seven cross-veins before origin of *Rs*, in hind wing five or six. In the central part of the area between *M*<sub>2+3</sub> and posterior margin of hind wing three rows of cells.

Length of fore wing 31 mm.; hind wing 25 mm.; and abdomen of male 38 mm.

Fig. 1.



*Disparomitus rufocostatus*, sp. n., ♂, type.

1 ♂, Murungu Plateau, 6000 ft., Belgian Congo, at light (T. A. Barns leg.).

I have without hesitation placed this species in the genus *Disparomitus*, Weele ('Collections Zoologiques,' Selys, Ascalaphiden, p. 191, 1908), although the saddle-shaped elevation on the dorsum of the first abdominal segment is hardly so conspicuous as in the other species included in the genus.

*Palpares pulchellus*, sp. n.

Head jet-black; labrum and front part of clypeus yellowish (in the female specimen the labrum is blackish brown with yellowish margins). On the clypeus a transverse row of blackish bristles. Palpi blackish with yellowish articulations. Antennæ black. Vertex somewhat raised and with a median longitudinal furrow. Prothorax dark brown, with narrow

yellowish front margin; three transverse rows of blackish hairs. Mesothorax dark brown, with an ill-defined yellowish spot on dorsum; front part blackish-haired, hind part whitish-haired. Metathorax with two yellowish spots on dorsum; whitish-haired. Underside of thorax blackish; whitish-haired. Legs blackish. Abdomen brownish yellow above; blackish below. First and second abdominal segments mostly blackish above; tip of abdomen blackish above; in the male the apical segment is yellowish-margined posteriorly. Anal appendages of male as long as eighth segment,

Fig. 2.



*Palpares pulchellus*, sp. n. (from Bavarian Krantz: Oxford University Museum).

pale, blackish-haired, curved, and their tips convergent. Wings long and slender; rather acute at their tip. The ground-colour of fore wing sooty brown; at base orange-coloured. The whole wing sprinkled over with numerous hyaline spots, most of which are filled up with an orange-coloured central part, circumscribed by a hyaline circle. Venation of fore wing brown; whitish in the pale-coloured parts; most of the cross-veins in the apical quarter whitish. Ground-colour of hind wing lacteous; hyaline towards base. Markings sooty brown.



Length of fore wing 47-52 mm.; hind wing 44-48 mm.  
length of body, ♂ 55, ♀ 47 mm.

1 ♂, 1 ♀, Deelfontein, South Africa (Col. Sloggett, 1903-109).

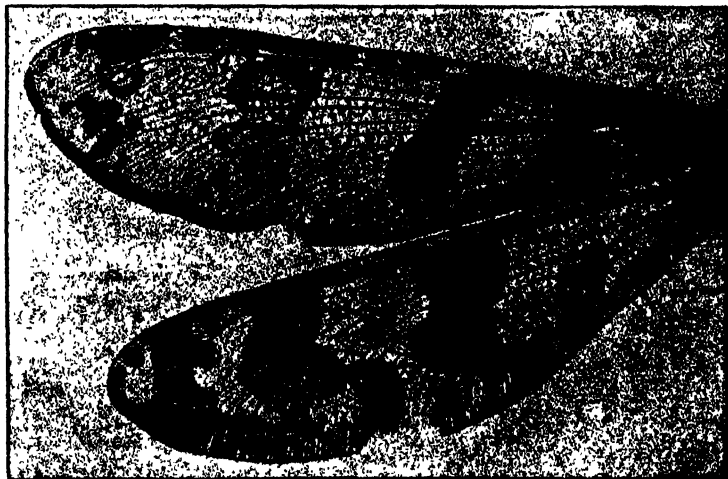
Beside these two specimens, I have seen another specimen (head and abdomen lost) from Orange River Colony, 20 m. above Orange River Station, Baviaan Krantz, 20th Jan., 1905 (at light) (*F. B. Parkinson* leg.). This specimen was forwarded to me for determination by Dr. Guy A. K. Marshall, Director of the Imperial Bureau of Entomology.

*P. pulchellus* has much resemblance to *P. dubiosus*, Péring. (*P. formosus*, Bks.), from which it may be separated by its peculiar and irrotated fore wings and by its larger size. Hind wing of *P. dubiosus* with a large circular spot over fork of  $M_2$ ; in *pulchellus* is found an irregular spot.

*Palpares auratus*, sp. n.

Labrum and clypeus yellowish; each of them with a transversely-placed row of dark bristles. Palpi pale brownish

Fig 8.



*Palpares auratus*, sp. n., ♀, type.

yellow. Insertions of antennæ yellowish. Antennæ lost, with exception of basal joint, which is pale brown. Face and anterior part of vertex brownish; between the insertions of antennæ a longitudinal dark streak. Vertex somewhat raised; in front with a short median longitudinal furrow; on top with a dark spot at each side, and posteriorly with a dark

spot close to each eye. Prothorax brown, with an orange-coloured lateral streak, and with an ill-defined, yellowish, longitudinal, median streak. Meso- and metathorax orange-coloured, brownish at base of wings. Venter of thorax orange-coloured. Thorax with long, orange-coloured pilosity, dorsally and ventrally. Legs brown, with short whitish hairs and long blackish bristles. Abdomen orange-coloured; towards apex with brown markings. Base of abdomen whitish-haired; towards apex short blackish hairs. Wings rather broad, with obtusely rounded apex. Markings pale sooty brown. Membrane of fore wings strongly orange-coloured; that of hind wing hyaline, with the exception of the pterostigma and the apical spot, which are orange-coloured. The four cross-bands in fore wing somewhat tessellated. Venation yellowish; in the markings brownish red.

Fore wing 60 mm.; hind wing 57 mm.; body 46 mm.

1 ♀, Kotakota, Nyasaland, 1911-447 (*Dr. J. E. S. Old leg.*).

Only the present specimen is known of this peculiar species, which is unlike what I have seen of other species, both with regard to form and to arrangement of markings, and also to the intensive orange-coloured membrane of the fore wing. I can hardly imagine that this colour is due to any chemical effect of the killing-bottle.

The specimen is in a rather bad condition; it has lost its right fore wing and its antennæ.

*Note.*—Mr. Herbert Campion has pointed out to me that the generic name *Colobopterus*, Rambur (*Hist. Nat. Ins., Névropt.* p. 360), is preoccupied by *Colobopterus*, Mulsant (*Hist. Nat. Coléopt. France, Lamellicornes*, p. 165). Rambur's work was published in the week ending 31st December, 1842, that of Mulsant about 6th August, 1842. Consequently Rambur's name (used in the Ascalaphidæ) has to be changed, and I propose the name *Ameropterus* for it.

**LXVIII.**—*On some Land Mites (Acari) from Spitsbergen and Bear Island. Results of the Oxford University Expedition to Spitsbergen, 1921.*—No. 23. By Rev. J. E. HULL, M.A.

THE mites collected represent three families:—Thrombidiidæ, 6 species; Gamasidæ, 1 species; and Oribatidæ, 5 species. All have been previously recorded as Arctic species, but four

have not hitherto been met with in the region now dealt with, and are marked with an asterisk in the appended list.

Localities are indicated by letters as follows:—

- A. Prince Charles Foreland (July 1–10).
- B. Bear Island (June 14–22).
- C. Cape Boheman (July 12–16).
- D. Gips Valley (June 26).
- F. Advent Bay (July 18).
- K. Bruce City, Klaas Billen Bay (July 25–August 11).

### I. Thrombidiidæ.

1. *Bdella littoralis*, Linn. K.

Generally distributed in the Arctic; also on the coasts of Northern Asia and Europe.

2. \**Bdella gromlandica*, Träg. A, B, C.

Type from Greenland (*Levinson*). I have seen examples from Jan Mayen (*Bristowe*, 1921). Probably passed over in previous collections as a small form of *littoralis*. No other records.

3. *Bdella decipiens*, Thor. A, F, D, K.

Exclusively Arctic. Generally distributed, but apparently less frequent than *littoralis*.

4. \**Bdella pallipes*, L. Koch. K.

Siberia, Novaja Semlja. This seems to have been confounded with *littoralis* until quite recently, yet it is quite common in Britain at all altitudes, but most abundant from about 800 feet upwards (in the north of England). Trägårdh ('Arktischen Acariden,' 1904) makes it a variety of *B. capitata*, Kramer, which itself appears to be a mere casual form of *littoralis*. In reality *pallipes* is a very distinct species, easily recognized by the equal length of the third and fourth joints of the palp.

5. *Cyta brevirostris*, L. Koch. A, B, K.

Apparently general in the Arctic, but not noted beyond that area, where its place is taken by *C. latirostris*, Herm. It is cited by Trägårdh (*op. cit.*) as a variety of the latter. It is quite different, however—most obviously in the greater relative length of the terminal article of the palp, which is about two-thirds of the length of the second (in *latirostris* it is less than half). *C. latirostris* is considerably larger and ranges southward to the Mediterranean.

6. *Rhagidia gelida*, Thor. B, F, K.

Quite general within the Arctic circle, and not known beyond it.

II. Gamasidæ.

7. \**Hypoaspis ovalis*, L. Koch, ♂.

This I found alive (along with a single living example of *Scutovertex lineatus*) in the moss used in packing a stone from Bear Island. Koch's single Siberian example was a female, so the name cannot be considered absolutely certain ; but in all essential characters the present example agrees with *ovalis*.

III. Oribatidæ.

8. *Scutovertex lineatus*, Thor. A, B ; also Bear Island (alive in moss).

Other records : Siberia, Novaja Semlja, Jan Mayen (*Bristowe*, 1921), Sweden, Britain. Always maritime in Britain and Sweden.

9. *Sphærozetes notatus*, Thor. A, B, C, F.

Quite general in the Arctic. Elsewhere my own British records stand alone. In Britain it does not seem to affect either the hills or the coast.

10. \**Oribatula exilis*, Nic. A.

Identical with British examples. Trägårdh (*op. cit.*) makes all other Arctic examples var. *crassipes*, L. Koch, which is probably a mistake (see note on the next species).

11. *Ceratoppia bipilis*, Herm. A.

Quite typical, even in size. So also were examples received by me from Jan Mayen (*Bristowe*, 1921). According to Trägårdh (*op. cit.*) all previous Arctic examples are to be referred to var. *spherica*, L. Koch ; but he relies too much on the accuracy of Michael's figures in dimensional detail.

12. *Hermannia reticulata*, Thor. A.

General in the Arctic and probably also in the north temperate region, though records are very few. Not rare in Britain, and not either maritime or montane.

## PROCEEDINGS OF LEARNED SOCIETIES.

## GEOLOGICAL SOCIETY.

June 14th, 1922.—Dr. G. T. Prior, F.R.S.,  
Vice-President, in the Chair.

The following communication was read:—

‘On some Rugose Corals from the Burindi Series (Lower Carboniferous) of New South Wales.’ By Prof. William Noel Benson, B.A., D.Sc., F.G.S., and Stanley Smith, M.A., D.Sc., F.G.S.

This paper describes two genera, one of which is new, and includes observations concerning species of *Lithostrotion* from the Burindi Series (New South Wales). The corals were obtained from the western foothills of the New England Plateau, which occupies the north-eastern portion of the country.

The stratigraphical succession of the region is briefly discussed: this consists mainly of Upper Palæozoic rocks—Devonian to Permian. The Burindi Series is made up of olive-green mudstones and tuffs, with occasional lenticular masses of oolitic and crinoidal limestone; and it was from these calcareous intercalations that the corals were obtained. Reasons are stated for correlating the Burindi Series with the Viséan.

The corals described are related respectively to *Cyathophyllum* and *Lithostrotion*. Both forms are characterized by an abnormally large columella, analogous to that seen in *Cyathaxonia*. The genera illustrate a remarkable case of parallelism.

The species of *Lithostrotion* obtained from the Burindi Series and from equivalent beds in Queensland share in common certain small peculiarities of structure, which distinguish them as a group from their British congeners.

## MISCELLANEOUS.

*On the Dates of Cuvier, ‘Le Règne Animal,’ etc. (Disciples Edition).*  
By C. DAVIES SHERBORN.

THE volume on Crustacea (VIII.) is absent in this set, and, as the dates of publication are unknown to me, it was not possible to include them in the list given in *Ann. & Mag. Nat. Hist.* (9) x. pp. 555, 556 (1922).

# INDEX to VOL. X.

---

- ACANTHENCHELYS**, characters of the new genus, 296.  
**Acantholepis**, new species of, 30.  
**Acari**, notes on, 621.  
**Acomys**, new species of, 107.  
**Æphnidius**, new species of, 109.  
**Alcimus**, new species of, 40.  
**Alexander, C. P.**, on new or little-known *Tipulidæ*, 83, 557.  
**Alofia**, new species of, 289.  
**Amphineurus**, new species of, 87, 563.  
**Anagoricophilus**, characters of the new genus, 80.  
**Anchomenus**, new species of, 165.  
**Andrena**, new species of, 265.  
**Andrewes, H. E.**, on Oriental *Carabidæ*, 161.  
**Andrews, C. W.**, on the skeleton of a large *Plesiosaur*, 407.  
**Anexodes**, new species of, 355.  
**Anomoderus**, new species of, 436.  
**Aphænogaster**, new species of, 17.  
**Aphrophora**, new species of, 159.  
**Apodemus**, new species of, 404.  
**Arctonyx**, new species of, 395.  
**Arrow, G. J.**, on *Coleoptera* from the *Seychelles Islands*, &c., 73.  
**Aruta**, characters of the new genus, 471.  
**Ashmeadiella**, new species of, 545.  
**Astilidæ**, new, 36, 517.  
**Astilus**, new species of, 46.  
**Aspicolpus**, new species of, 279.  
**Assiminia**, new species of, 122.  
**Asterina**, new species of, 416.  
**Asteroides**, notes on, 590.  
**Auriculastris**, new species of, 121.  
**Aurivillius, Chr.**, on *Coleoptera* from the *Seychelles Islands*, &c., 421.  
**Axana**, characters of the new genus, 471.  
**Barker, C. N.**, on new South African *Carabidæ*, 170; on South African species of *Hypolithus*, 359.  
**Beddard, F. E.**, on the genus *Notykus* (Mich.), 599.  
**Bibliographical notices**, 245, 553.  
**Bothriomyrmex**, new species of, 27.  
**Brachyconger**, characters of the new genus, 217.  
**Bryozoa**, on Mediterranean, 1.  
**Campion, H.**, on *Odonata* from Argentina, 290.  
**Camponotus**, new species of, 81.  
**Camptocladus**, new species of, 201.  
**Carabidæ**, new, 161, 170, 359.  
**Carcineretes**, new species of, 535.  
**Caricea**, new species of, 581.  
**Carriola**, characters of the new genus, 468.  
**Carruthers, W.**, notice of death, 176.  
**Chætolispa**, characters of the new genus, 386.  
**Chalicoroides**, characters of the new genus, 323.  
**Chalicorus**, new species of, 323.  
**Chalicotheres**, new, 542.  
**Champion, G. C.**, on the S. African species of *Dinometopus*, &c., 309.  
**Charronia**, new species of, 610.  
**Chlænium**, new species of, 171.  
**Cichlidæ**, new, 249.  
**Clarias**, new species of, 122.  
**Cockerell, T. D. A.**, on fossil *Arthropods* in the British Museum, 157; descriptions and records of bees, 265, 544.  
**Cœlostomus**, new species of, 164.  
**Cœnosia**, new species of, 585.  
**Coleoptera**, new, 73, 309, 421.  
**Colotes**, new species of, 340.  
**Colpometus**, new species of, 352.

- Connolly, M., on new species of non-marine Mollusca, 113; on African non-marine Mollusca, 485.
- Crawley, W. C., on new ants from Australia, 16.
- Cromatogaster, new species of, 21.
- Cricotopus, new species of, 209.
- Crocidura, new species of, 101.
- Crossotarsus, new species of, 145.
- Crustacea, new, 534.
- Cyrtomychus, new species of, 78.
- Dakin, W. J., and Fordham, M. G. C., on some new Asilids from Western Australia, 517.
- Diamasa, new species of, 213.
- Dicranomyia, new species of, 83, 558.
- Dinapsidæ, characters of the new family, 418.
- Dinomotopus, new species of, 311.
- Diospilus, new species of, 280.
- Diptera, new, 193, 379, 573.
- Disophrys, new species of, 277.
- Diapromitus, new species of, 617.
- Dolichoderus, new species of, 25.
- Dremomys, new species of, 401.
- Dysmachus, new species of, 55.
- Echinoderma, new, 415.
- Edouardia, new species of, 120.
- Edwards, F. W., on Diptera Nemato-cera from Spitsbergen, 193.
- Elmhirst, R., on Lucernaria quadricornis and related species, 221.
- Endovipio, characters of the new genus, 273.
- Erynaceus, new species of, 616.
- Esben-Petersen, on new species of Neuroptera, 617.
- Exomalopsis, new species of, 265.
- Euryglossella, new species of, 548.
- Eutropius, new species of, 126.
- Euxestus, new species of, 76.
- Felis, new species of, 609.
- Fisher, W. K., on a new sea-star from Hong Kong, 415; notes on Asteroides, 590.
- Flynn, T. T., on reproductive phenomena in Tasmanian marsupials, 225.
- Fordham, M. G. C., *see* Dakin, W. J.
- Forster-Cooper, C., on a new Chalcidæ from India, 542.
- Gecarcoidea, note on, 530.
- Geocendomychus, new species of, 80.
- Geological Society, proceedings of the, 245, 553, 624.
- Gnophomyia, new species of, 565.
- Gonaxis, new species of, 113.
- Goodey, T., on the eel-worm in paper-hangers' paste, 297.
- Gulella, new species of, 114, 491.
- Gynoplistia, new species of, 569.
- Hackeriapis, new subgenus, 267.
- Halictus, new species of, 550.
- Haplochromis, new species of, 258.
- Hastites, characters of the new genus, 161.
- Helicogaster, new species of, 356.
- Holigmonsura, new species of, 61.
- Helina, new species of, 137.
- Helogale, new species of, 103.
- Heterochromis, characters of the new genus, 252.
- Hinton, M. A. C., and Pycraft, W. P., on the affinities of the genus *Lipotes*, 232.
- Hippeutis, new species of, 121.
- Hirst, S., on a new Linguatulid from the Adriatic, 289.
- Holcobracon, new species of, 274.
- Houssidipnis, new species of, 354.
- Hooleya, characters of the new genus, 160.
- Hull, J. E., on land mites from Spitsbergen and Bear Island, 621.
- Hymenoptera, new, 418.
- Hypolithus, new species of, 367.
- Idobrium, new species of, 432.
- Kershaw, P. S., on mammals from Northern Rhodesia, 99; on mammals from Nyasaland, 179.
- Khalil, M., on the morphology of *Brachyclonus indicus*, 235; on a new nematode from the Norwegian beaver, 281.
- Leigh-Sharpe, W. H., on a curious hermaphrodite frog, 111.
- Linnuophila, new species of, 92, 506.
- Liparidæ, revision of, 449.
- Liphistioidæ, notes on, 444.
- Lispa, new species of, 387.
- Lönnberg, E., and Rendahl, H., on some new Silurids from the Congo, 122.
- Lucernaria, notes on, 221.
- Machimus, new species of, 65, 529.
- Macromastix, new species of, 96, 572.
- Macrotherium, new species of, 542.
- Mahenes, new species of, 443.
- Malloch, J. R., on exotic Muscaridæ, 132, 379, 573.
- Mammals, new, 99, 111, 127, 129, 143, 179, 232, 212, 307, 391, 550, 552, 607, 614, 616.

- Marsupiale, notes on, 225.  
 Mastacomys, new species of, 551.  
 Matopius, characters of the new genus, 326.  
 Meriones, new species of, 552.  
 Micronomia, characters of the new genus, 428.  
 Miltodes, characters of the new genus, 162.  
 Mimecyrida, characters of the new genus, 438.  
 Miscellaneous, on the dates of Cuvier, 555, 624.  
 Mollusca, new, 113, 485.  
 Molophilus, new species of, 89, 558.  
 Monocoila, new species of, 272.  
 Mori, T., on new mammals from Korea and Manchuria, 607; on two forms of the Korean hedgehog, 614.  
 Morice, F. D., on saw-flies from Spitsbergen, 219.  
 Muscaridæ, new, 132, 370, 573.  
 Myiopila, new species of, 132.  
 Nasillus, new species of, 303.  
 Nematodes, notes on, 235, 242, 281, 297.  
 Neoitamus, new species of, 528.  
 Neosaropogon, new species of, 523.  
 Nesopupa, new species of, 119.  
 Neuroptera, new, 617.  
 Nopcea, F., on the probable habits of the Dinosaur Struthiomimus, 152; on a case of secondary adaptation in a tortoise, 155.  
 Norman, J. R., on new fishes from New Britain and Japan, 217; on a new eel from Tobago, 292.  
 Nyctereutes, new species of, 607.  
 Nycteris, new species of, 179.  
 Obituary notice, Carruthers, W., 176.  
 Obrium, new species of, 435.  
 Odonata, notes on, 290.  
 Olistherarthrus, characters of the new genus, 336.  
 Opeas, new species of, 120.  
 Orgilus, new species of, 276.  
 Osmia, new species of, 266.  
 Palpares, new species of, 618.  
 Pamponerus, new species of, 54.  
 Parachromis, characters of the new genus, 251.  
 Paradandamis, characters of the new genus, 427.  
 Paraechinus, new species of, 307.  
 Perameles, new species of, 144.  
 Perdita, new species of, 547.  
 Petaurista, new species of, 396.  
 Petronievica, B., on root-division in the molar teeth of Tritylodon, 216.  
 Pheidole, new species of, 24.  
 Phellus, new species of, 521.  
 Philpot, F., on a new nematode from the "Saki" monkey, 242.  
 Pisces, new, 217, 249, 296, 587.  
 Planetes, new species of, 166.  
 Platygnathus, new species of, 425.  
 Platypodidæ, new, 145.  
 Platypus, new species of, 147.  
 Polyrhachis, new species of, 36.  
 Pristaulacus, new species of, 271.  
 Pseudohelcon, new species of, 278.  
 Pterolophia, new species of, 439.  
 Ptychotrema, new species of, 489.  
 Punctum, new species of, 119.  
 Pycraft, W. P., *see* Hinton. M. A. C.  
 Pygophora, new species of, 381.  
 Questopogon, new species of, 525.  
 Rattus, new species of, 404.  
 Regan, C. T., on the classification of the family Cichlidæ, 249; on Clupeid fishes, 587.  
 Rendahl, H., *see* Lönnberg, E.  
 Reptiles, notes on, 155.  
 Rhabdomastix, new species of, 90.  
 Rhynchomydæa, characters of the genus, 134.  
 Ricardo, G., on South African and Oriental Asilidæ, 36.  
 Robertsonella, new species of, 546.  
 Rothschild, Lord, on a new subspecies of Zaglossus, 129; on a new race of Bharal, 231; description of a new baboon, 232.  
 Rupestes, characters of the new genus, 308.  
 Savory, T. H., on the spider Liphistius, 444.  
 Scolytidæ, new, 145.  
 Sherborn, C. D., on the dates of Cuvier, 555.  
 Silurids, new, 122.  
 Sitala, new species of, 116.  
 Solenopsis, new species of, 16.  
 Spharotrypes, new species of, 150.  
 Sphecodes, new species of, 547.  
 Sphinginopalpus, new species of, 328.  
 Spilaria, new species of, 132.  
 Streblacera, new species of, 280.  
 Streptostele, new species of, 502.  
 Struthiomimus, notes on, 152.

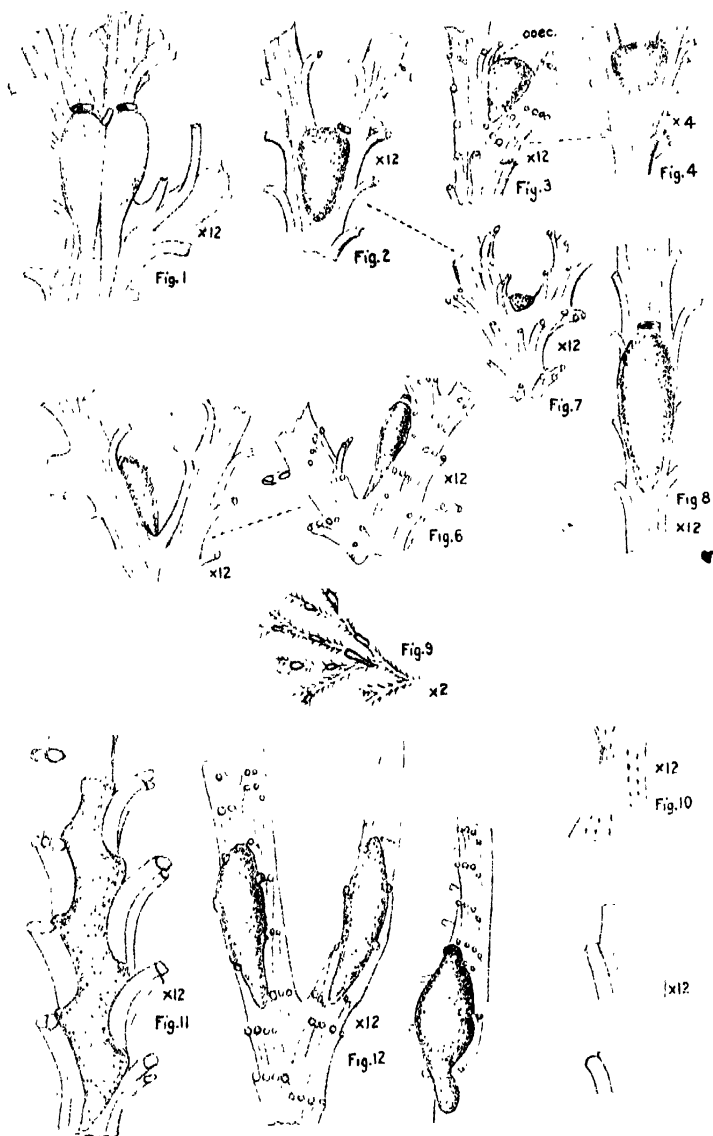


- Swinhoe, C., a revision of the genera of the family Liparidae, 449.  
 Tadarida, new species of, 392.  
 Taterona, new species of, 106.  
 Tayloria, new species of, 437.  
 Thomas, O., on lectotypes of typical Australian marsupials, 127; on a new subspecies of Zaglossus, 129; on bandicoots allied to Perameles bougainvillei, 148; on a new hedgehog from Aden, 307; on mammals from the Yunnan highlands, 391; on a new species of Mastacomys, 550; on a new jird from Southern Palestine, 552; on a new bat from N. Australia, 616.  
 Tipulidae, new, 83, 557.  
 Tolmerus, new species of, 62.  
 Trachycystis, new species of, 116.  
 Trachypterus, new species of, 217.  
 Travassosius, characters of the new genus, 281.  
 Tritylodon, note on, 216.  
 Trogloditica, characters of the new genus, 148.  
 Troglopa, new species of, 317.  
 Turner, R. E., on new Evanidae and Braconidae, 270.  
 Varicostele, new species of, 516.  
 Waters, A. W., on Mediterranean Tervia and Idmones, 1.  
 Waterston, J., on a new family of Hymenoptera from South Africa, 418.  
 Webb, G. E., on some young stages of Gecarcoides islandii, 530.  
 Webbia, new species of, 149.  
 Winn-Sampson, F., on new Scolytidae and Platypodidae, 145.  
 Withers, T. H., on a new brachyurous crustacean, 534.  
 Xenolipsa, new species of, 385.  
 Xyleborus, new species of, 151.  
 Zaglossus, new species of, 127.  
 Zuphium, new species of, 167.

END OF THE TENTH VOLUME.

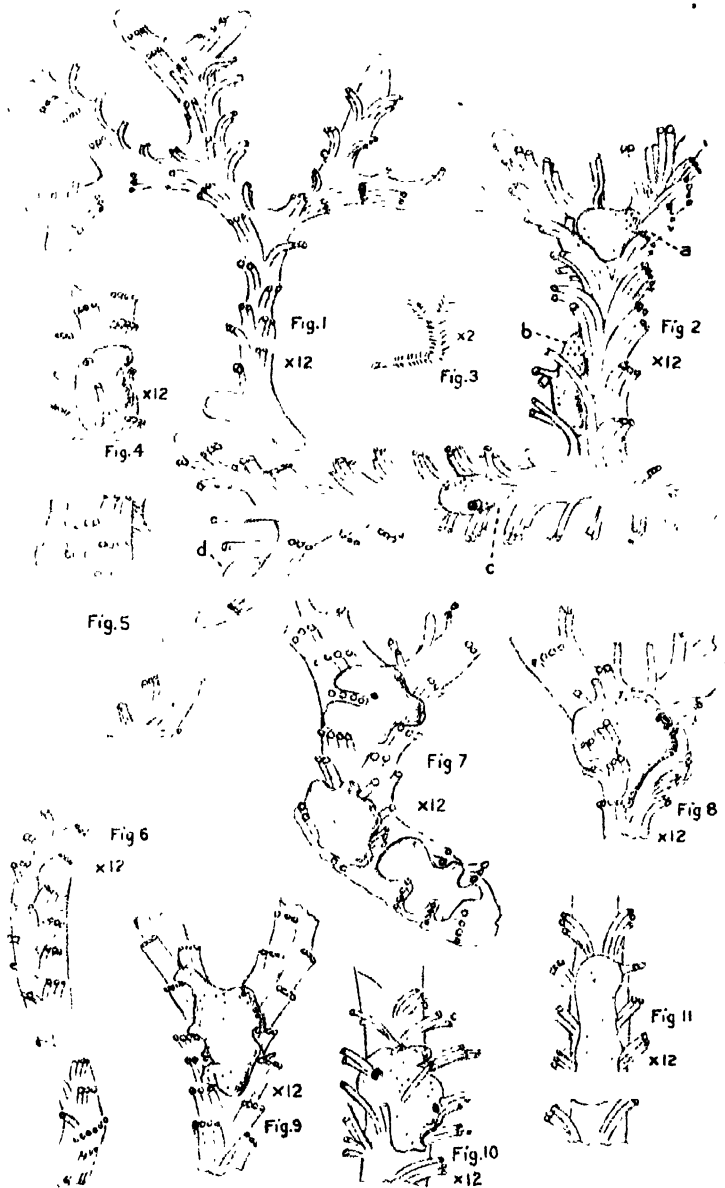






A.W. Waters del.

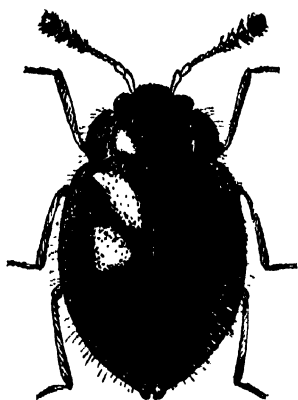




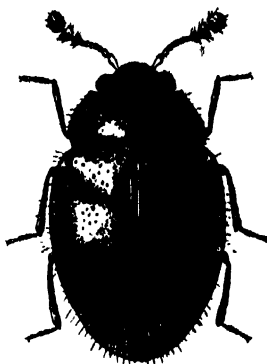
*A.W. Waters, del.*

**TERVIA and IDMONEA.**

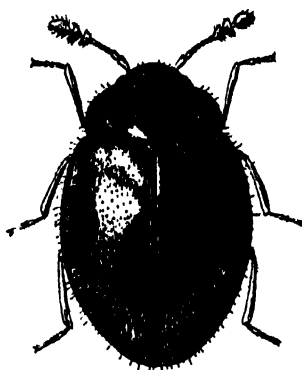




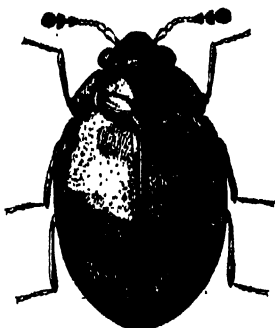
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*Miss O. F. Tossart, del.*

ENDOMYCHID COLEOPTERA FROM THE SEYCHELLES.







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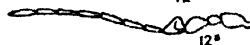
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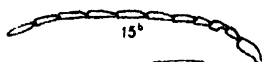
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QFT

AFRICAN MALACHIINÆ.





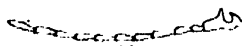
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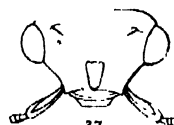
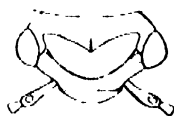
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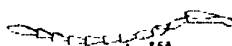
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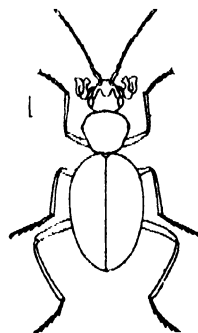
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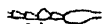
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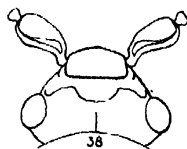
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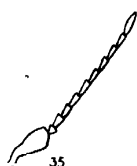
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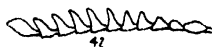


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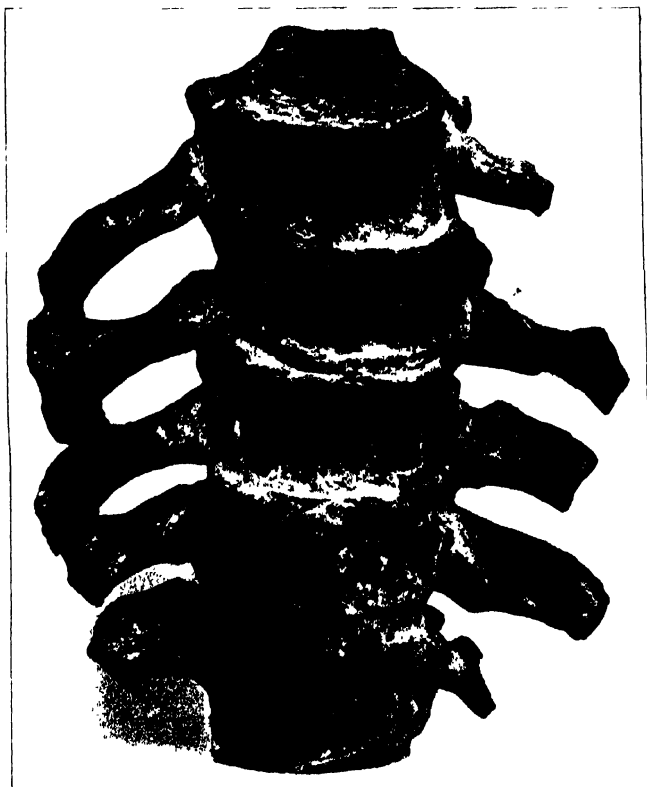


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Op. Tanaeri

## AFRICAN MALACHIINÆ





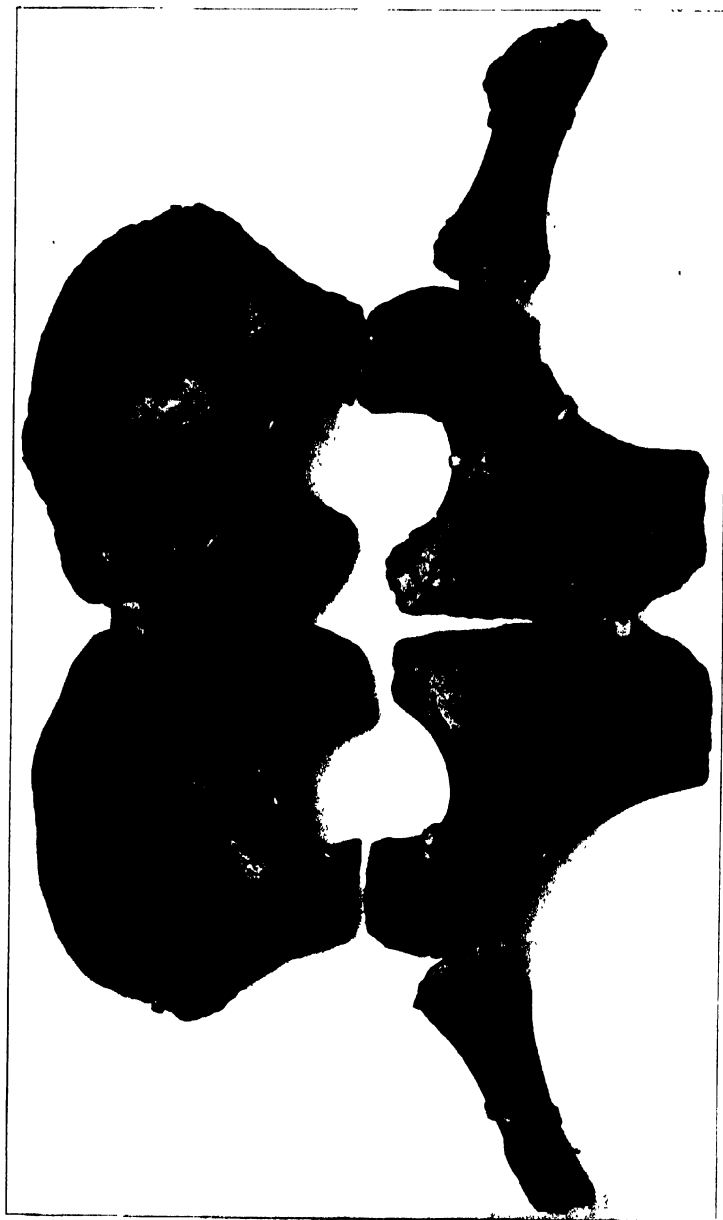
SACRAL REGION OF VERTEBRAL COLUMN OF RHOMALEOSAURUS THORNTONI, sp. n.  
About  $\frac{1}{4}$  nat. size.





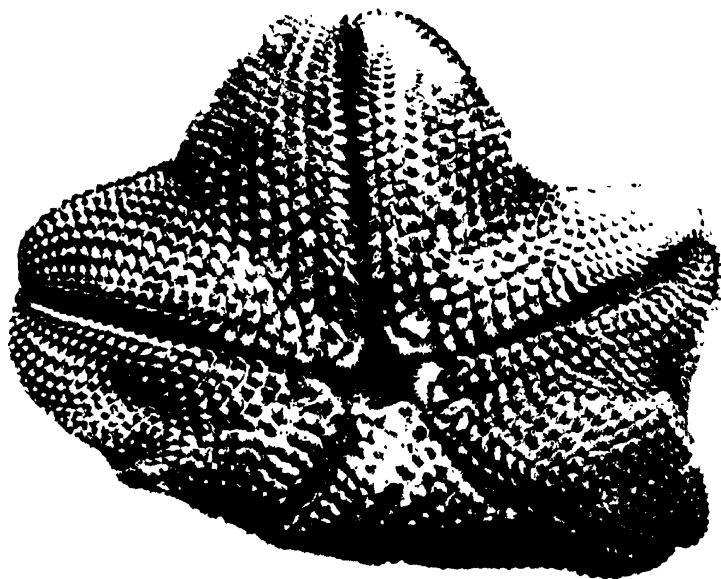
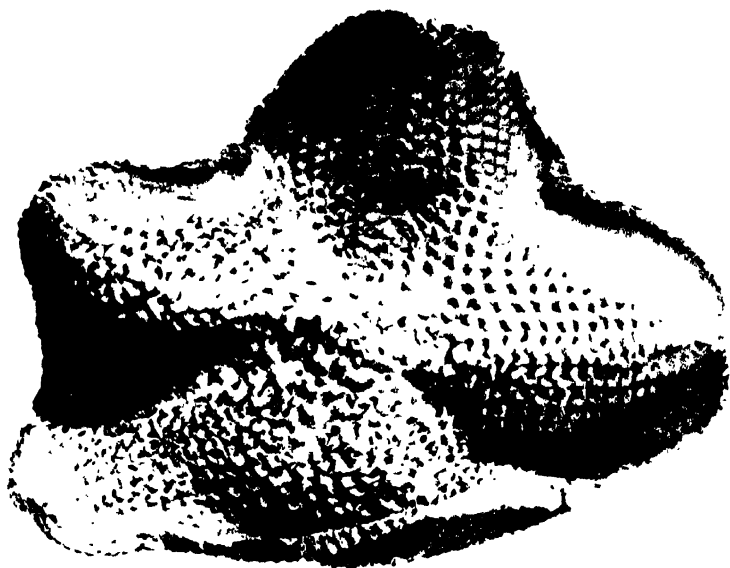






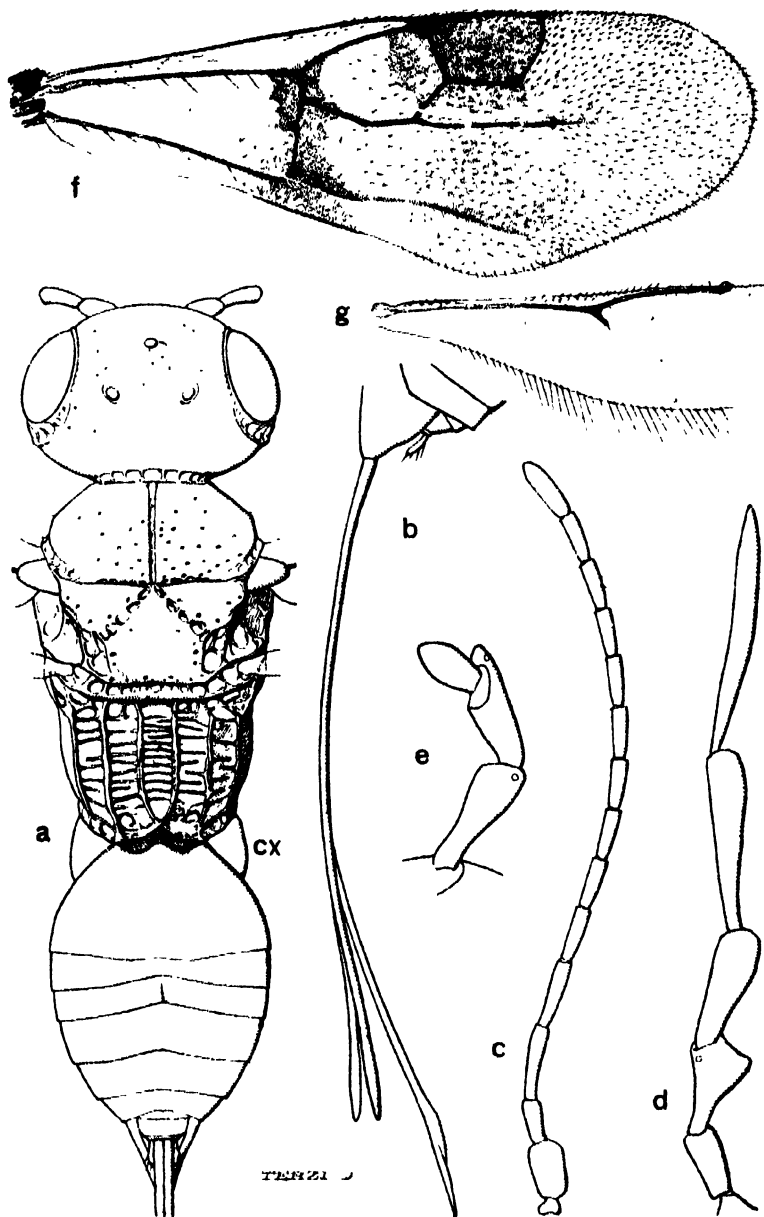
PELVIC GIRDLE OF RHOMALEOSAURUS THORNTONI, -p. n. About  $\frac{1}{2}$  nat. size.





ASTERINA ORTHODON.

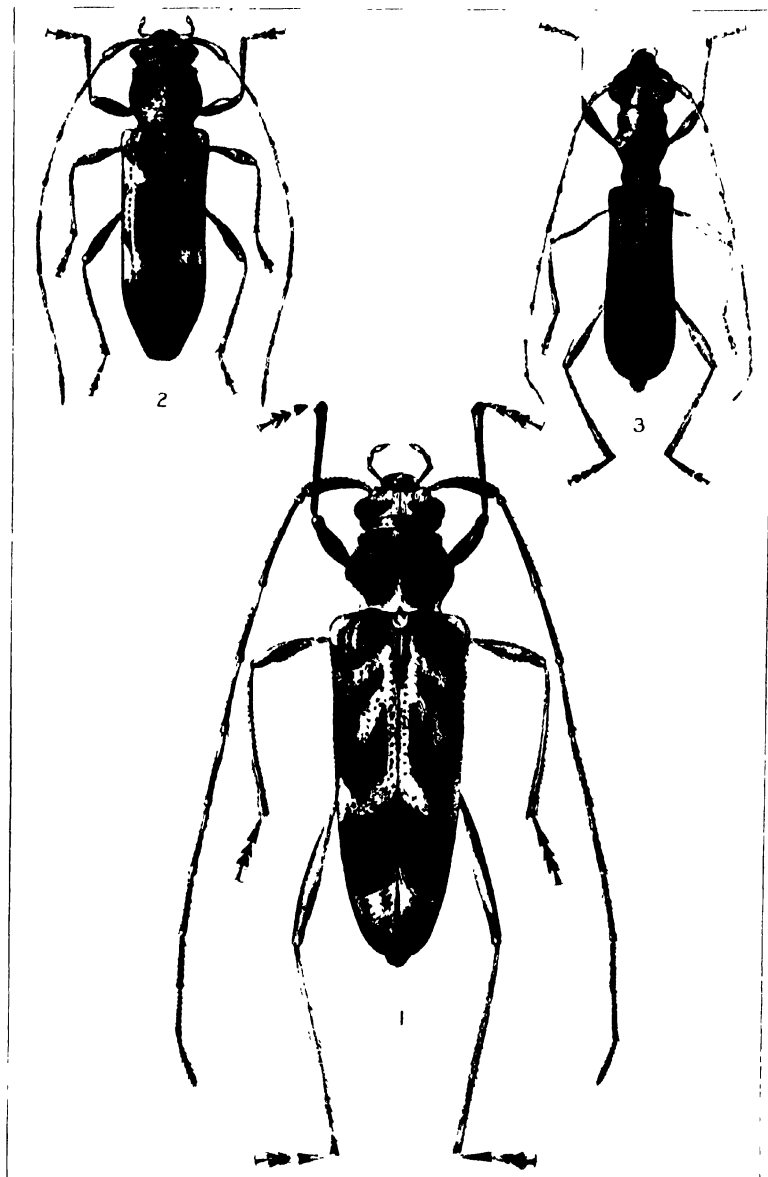




*DINAPSIS TURNERI* sp. n. ♀



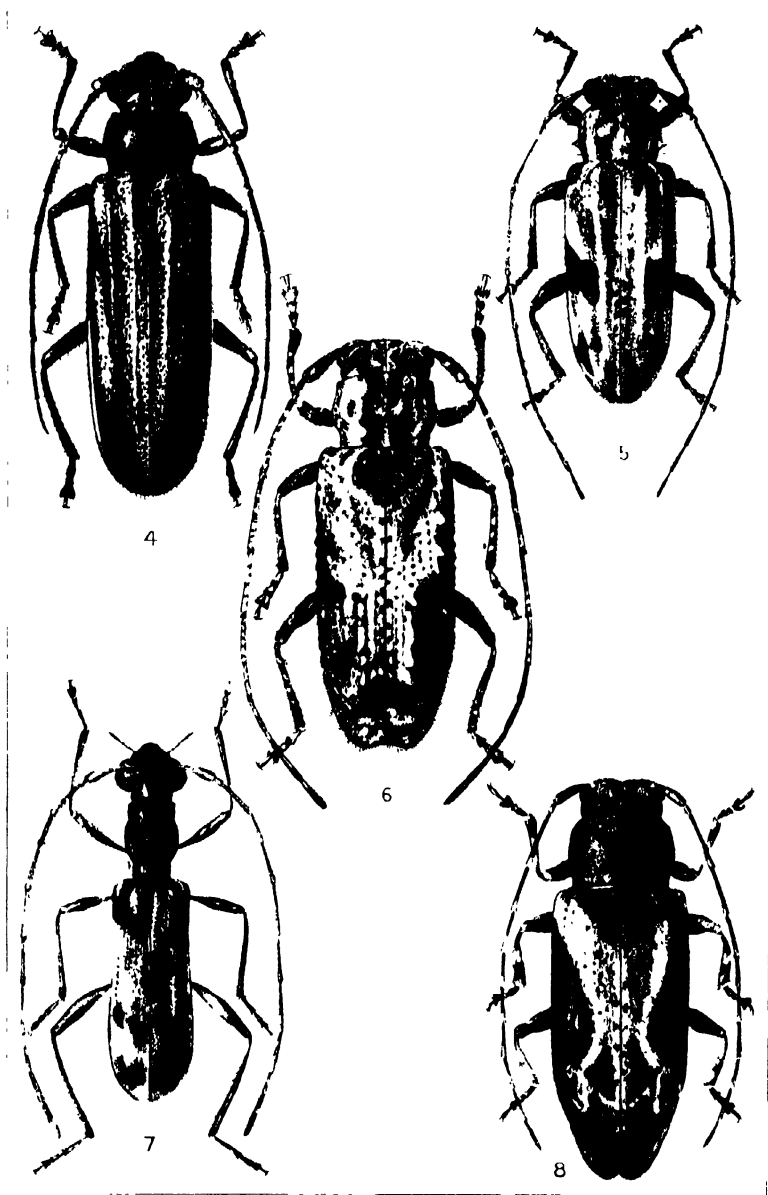




*Miss O. F. Loscut del.*

CERAMBYCIDÆ FROM THE SEYCHELLES.

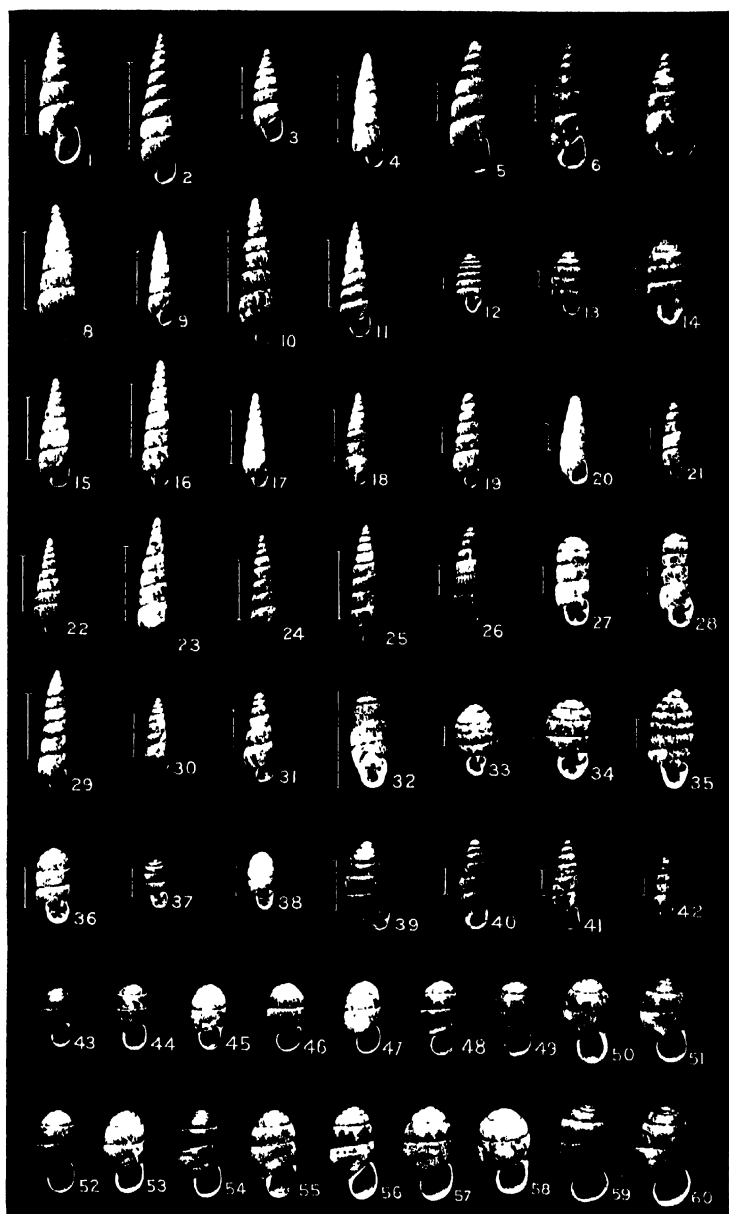




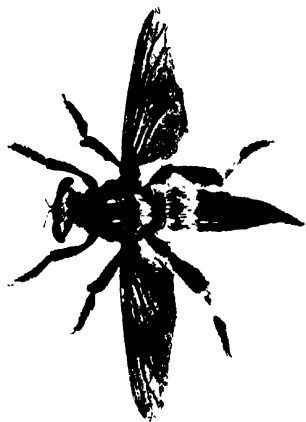
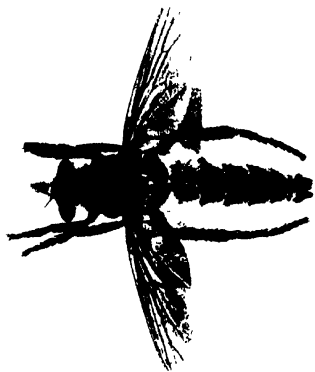
*M. S. O. T. Lacout del.*

CERAMBYCIDÆ FROM THE SEYCHELLES AND RODRIGUEZ.





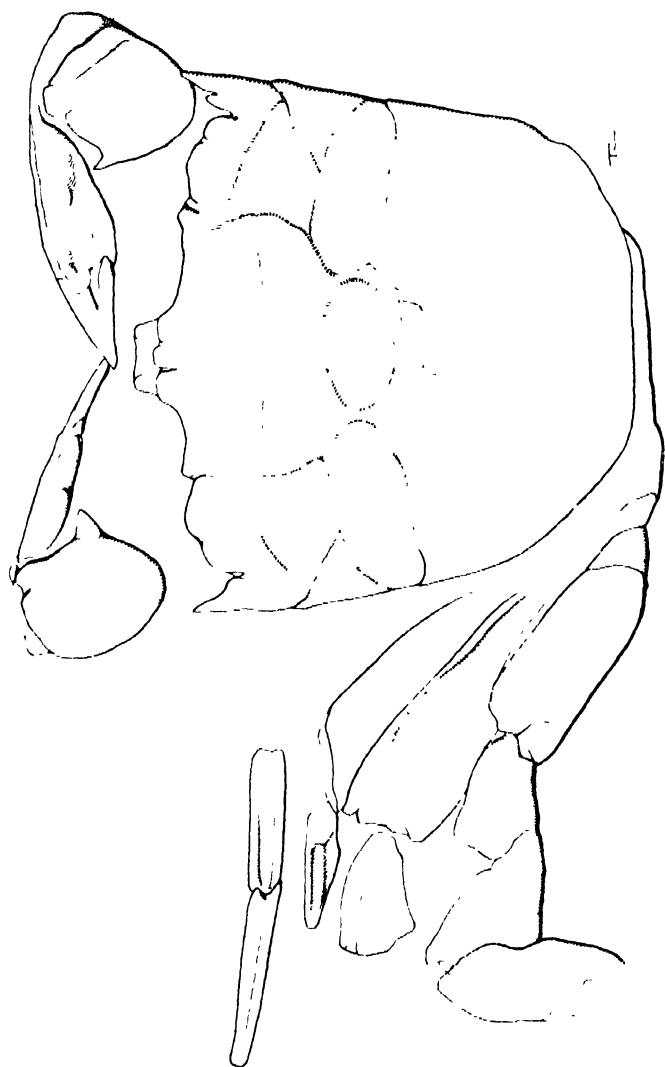




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*Carcineretes woolacotti*, gen. et sp. n.



FIG. 3.

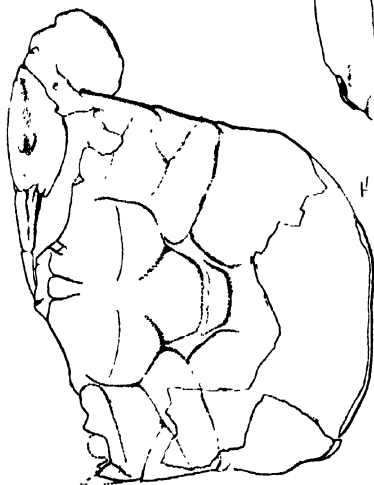


FIG. 4.

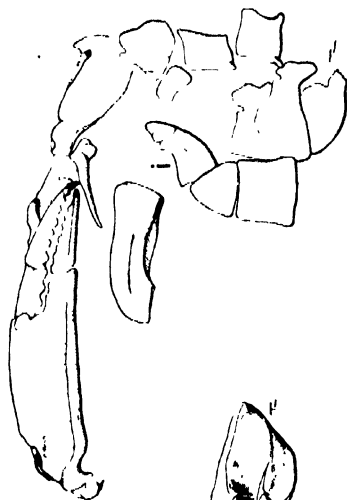


FIG. 5.



FIG. 6.



Ca

gen. et sp. n



